The Electrical Industry's Weekly Magazine

February 25, 1957

Electrical World

Price 35 Cents

A McGraw-Hill Publication

Sodium Graphite Reactor for '57 Commercial Use

... page 51

Purchasing Agents hear—

Two Views on Pricing . . . p 48

E B POWER GS W 12-
UNIVERSITY MICROFILMS IN
313 N 1 ST
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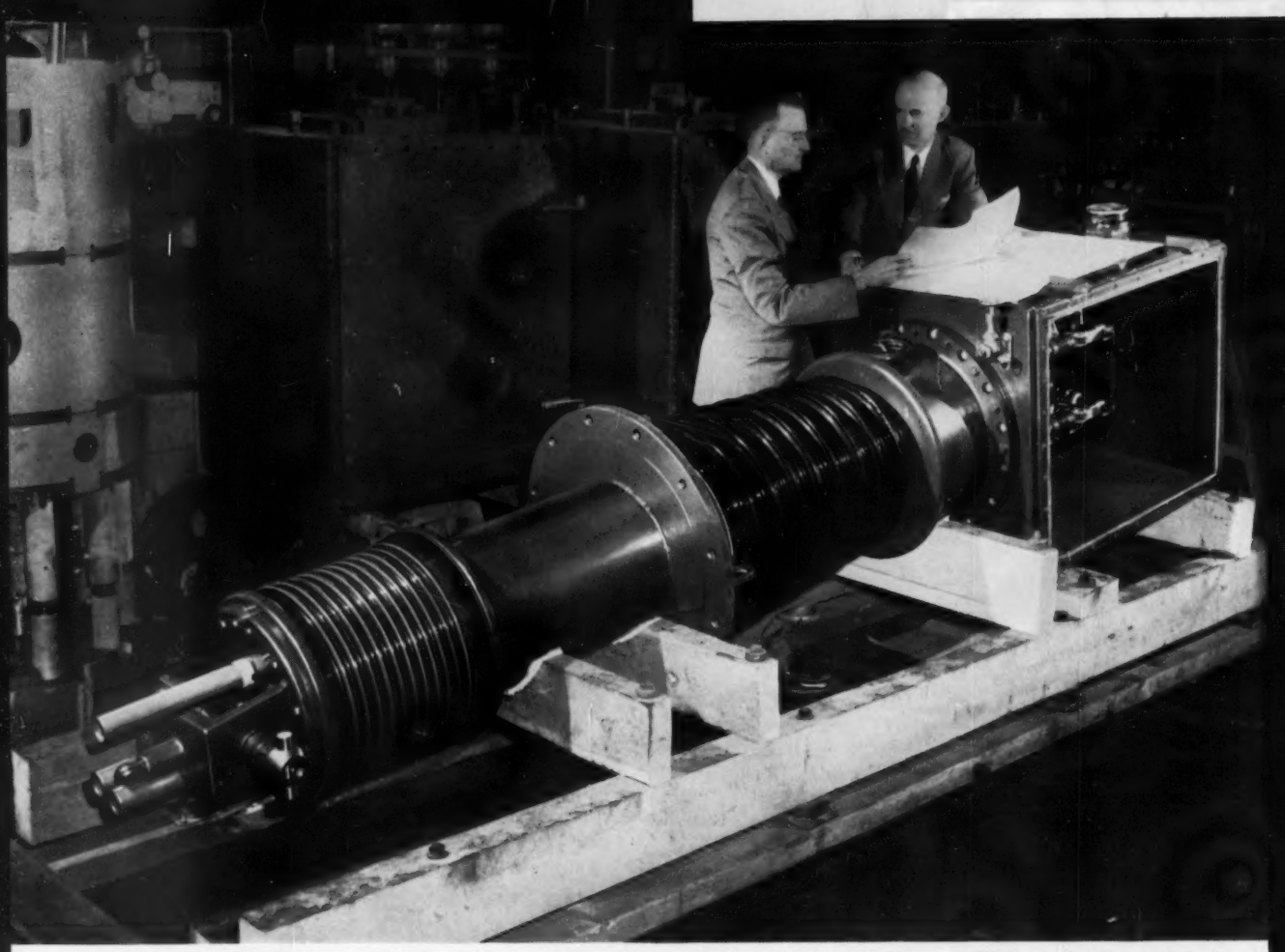
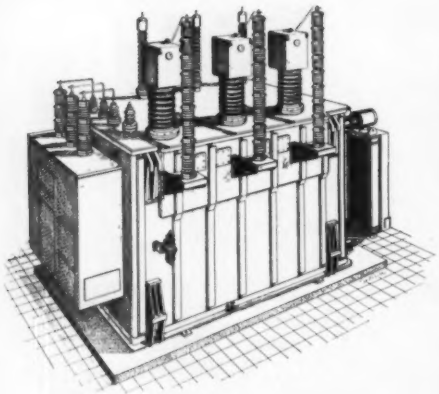


HORIZONTAL VIEW of bushing assembly shows LTC contactor mounted on top of bushing (right). Tap selector (not shown) is inside tank near windings. Checking assembly are L. Wetherill, Mgr.–Eng., and O. P. McCarty, Supr., LTC Eng., both of G.E.'s Power Transformer Department.

Unique load tap changer; largest built in the U.S. will help . . .

Facilitate high-voltage system interconnection



UNIQUE LOAD TAP CHANGERS are shown behind lightning arresters in sketch of Niagara Mohawk units. The 120-kv leads run to the top of the contactor compartments over the bushings.

System interconnection, usually at the highest voltages—to permit bulk power interchanging with reliability and economy—is helping to make load growth forecasts become realities. Interconnection can mean greater system reliability and economy to help meet the utilities' continuing objective of anticipating the needs of their growing number of customers. Important to this trend, as well as for system expansion, are the beneficial characteristics of bushing-mounted load tap changers to regulate kilovar flow and control voltage at the connection.

LARGEST OF ITS KIND

The largest bushing-mounted load-tap-changer mechanisms ever built in this country will be installed early this year by the Niagara Mohawk Power Corporation on two 125,000-kva autotransformers. Used to tie 230-kv and 120-kv lines together, this type of load tap changer is especially valuable because, unlike the usual LTC mechanism, it changes taps located right in the autotransformer's high-voltage winding. Its use will prevent the loaded tertiary voltage of the power transformers from varying. In addition, the impedance characteristics of these General Electric units, from maximum raise to lower position, are flatter—aiding system stability.

CO-OPERATIVE DEVELOPMENT

Working closely with utility company personnel, General Electric engineers designed these smaller and lighter units to aid in solving this particular problem of Niagara Mohawk.

For further information on applying General Electric's new load tap changer to your system, contact your local G-E Apparatus Sales Office. General Electric Co., Schenectady 5, New York. 301-342

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 147, No. 8 FEB. 25, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

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It's first U. S. test A-plant designed exclusively for electric power production ..... p 40

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Non-destructive, electronic testing spots cable flaws as small as a grain of sand . . . eliminates causes of failures that might occur after several years of service.

now all Okonite rubber strip-insulated cables rated above 2kv undergo the most searching test in the industry

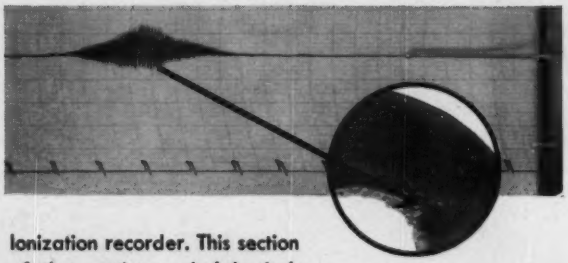
The Gooding Test Train, an Okonite development, can literally peer through every inch of solid dielectric cable to pinpoint flaws for removal or correction.

Two years' experience in regular production has proved that the Gooding Test Train detects flaws heretofore unrevealed even by the highest industry voltage tests or full-reel corona tests. Now that this valuable method of quality control has been thoroughly established, Okonite has extended its testing range to all strip-insulated cables rated above 2kv.

The entire cable passes through a series of three test units which provide unequalled assurance of successful service. The Gooding Test Train is used on strip-insulated cables in addition to Okonite's self-imposed, factory high-voltage acceptance tests which exceed industry specifications.

UNIFORMITY TEST—A uniformity gauge continuously checks insulation thickness to locate any thin spots.

IONIZATION TEST—The tiniest voids and imperfections are detected and located by measuring the corona level of the cable inch-by-inch. To pass, a cable must not show any trace of corona at a test voltage that is 1½ times the rated voltage of the cable. Defects that might escape any other known factory acceptance tests show up clearly on the associated ionization recorder. Defects of this kind can cause premature failure after only a few months' or years' service.



Ionization recorder. This section of the continuous inch-by-inch ionization test shows the recording of a defect in the insulation.

X-RAY TEST—A 250,000-volt X-ray machine can be used to study the nature and extent of any flaws located by the first two units.

For additional information about this revolutionary testing method, write for Bulletin EW-1100. The Okonite Company, Passaic, N. J.

4702

where there's electrical power...there's **OKONITE CABLE**

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. . . *from the publisher*

If you're a devotee of old TV movies, you've undoubtedly come across the epic about a man who somehow got a copy of tomorrow's newspaper.

By possessing that single copy 24 hours ahead of time, he was able to make a killing in the stock market and otherwise improve his position. But there was one ironic note to this man's happy circumstance. The same newspaper also carried his obituary notice.

Sometimes it's not always good to know of things to come. But in today's business it is indispensable. Electrical World has always tried to keep the industry informed of what's ahead. We do it every September in our annual Forecast Issue and every December in our predictions for the new year.

Now we've put it on an every-week basis with our new "Future News" section. Appearing this week on page 19, it gives you a glimpse of things today that will make industry news tomorrow.

In the seven weeks since it first appeared, Future News has carried 20 items. To date, five already have come to pass—not a bad batting average. Example: On Jan. 21 we told of still another atomic plant to go up—this one by a newly formed Midwestern utility group. Weeks later, Northern States Power announced a 60-Mw boiling water reactor. The full, final story is in this issue.

Fischer Black

ELECTRICAL WORLD

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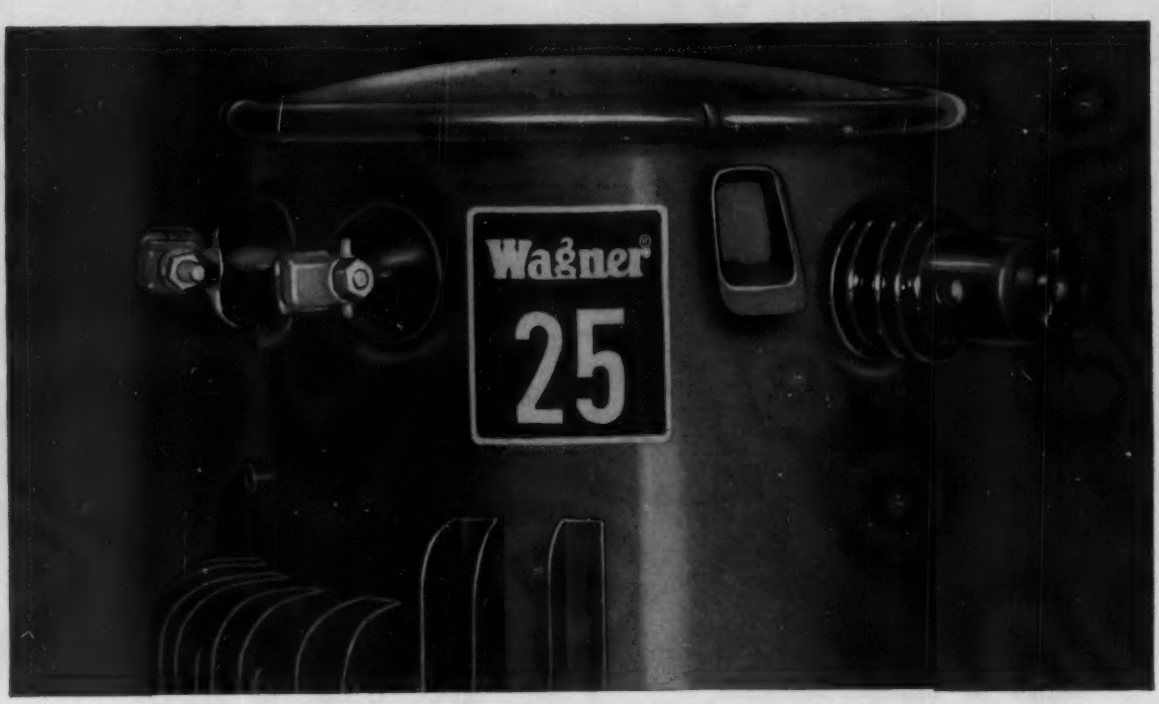


Wagner Form W Transformers

offer smaller size—lighter weight—sealed tank construction—key-locked safety bushings

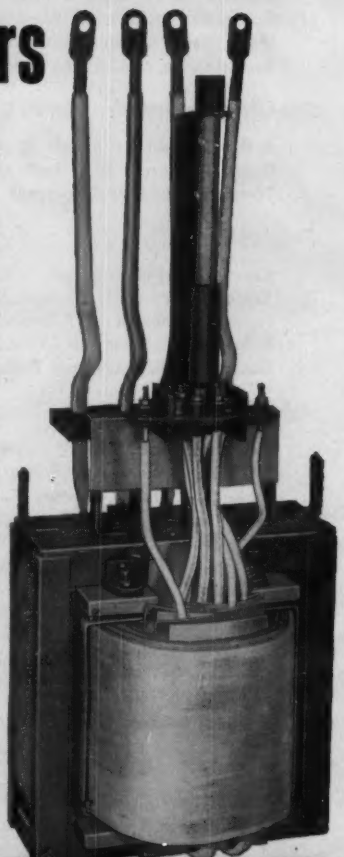
Wagner Form W Distribution Transformers, with wound cores and improved insulation, are now considerably smaller in size—lighter in weight than ever before. Yet they are liberally designed for excellent electrical performance—low core and copper losses—good regulation—high overload capacity for peak loads. Sixty-five years of transformer manufacturing experience are your assurance of Wagner dependability. Specify Wagner for your lines—get these proven features:

Only Wagner offers the Shur-seal cover design that keeps the transformer as air-tight as a welded tank, yet lets you remove the cover by loosening a single bolt.

Low voltage bushing and terminal are key-locked to prevent turning when tightening. Reduces danger of internal shorts. Takes copper or aluminum conductor.

High voltage sidewall bushing is safety-designed for insulated knob connection. Takes either copper or aluminum conductor. Porcelain and terminal are locked in position.

New Form W Element with cold-rolled wound core. Thermosetting insulation bonds coil element into a solid unit, braced to prevent shifting inside tank.



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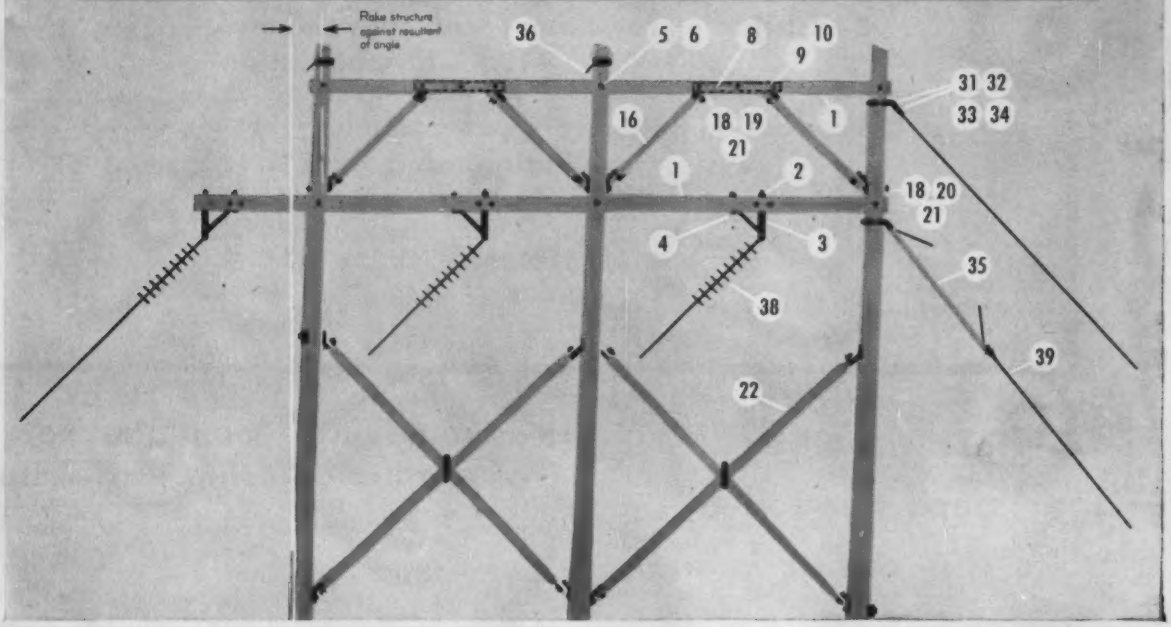
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

SMALL ANGLE STRUCTURE TYPE NO. 706

NORMALLY USED FOR ANGLES OF 4° — 15°. ADAPTABLE FOR VOLTAGES FROM 69 TO 154 KV

DRG. REF.=	QUANTITY	DESCRIPTION	DRG. REF.=	QUANTITY	DESCRIPTION
706	3	Pole	21	7	MF locknut ⅞"
1	4	Crossarm	22	2 sets	Cross base w/fittings, clamp, ⅞" pole bolts, and curved washers
2	3	Spacer fitting w/mfg. bolts			
3	3	Swinging angle bracket			
4	3	Saddle w/mfg. bolts	31	4	Pole band
5	6	Stud bolt ⅞" w/2 washer nuts	32	4 pr.	Connecting link
6	12	MF locknut ⅞"	33	1	Guy roller
8	2	Filler block	34	1	Machine bolt ⅜" x 2½"
9	6	Stud bolt ⅜" w/2 washer nuts	35	1	Wood guy strain insulator
10	12	MF locknut ⅜"	36	2	Suspension clamp for static wire
16	4	Knee brace			
18	7	Machine bolts ⅞" w/sq. nut	38	As required	Suspension insulators and fittings
19	4	Flat washer 4" sq. x ¼", 13/16" hole	39	–	Guying material
20	2	Curved washer 4" sq. x ¼" 13/16" hole			



FROM THE TOP OF THE POLE TO THE BOTTOM OF THE HOLE . . .

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Graybar will deliver complete pole line structures "packaged"—ready to assemble—to the job site.

All fabricating and boring of arms has been done. Hardware is attached. You're assured that every member fits perfectly.

The result? A better structure planned and assembled according to *your* specifications.

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To complete the "package", Graybar's experienced Outside Construction specialists and field representatives are always ready to help you tackle tough or unusual jobs along with regular service.

Remember, call Graybar *first*—for any transmission or pole line project. We'll gladly furnish help, advice, complete quotations and quality materials engineered and manufactured to assure uninterrupted service to your customers.

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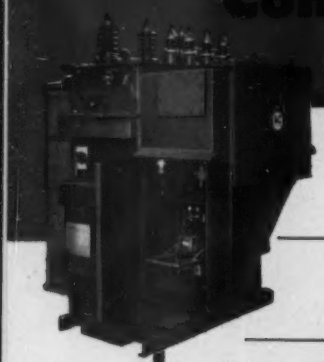
How regulators

Compare cost of LTC transformers



LTC on transformer with ±10% regulation	$12,287
3 Distribution regulators with conventional +10% −10% regulation	$11,670
3 Distribution regulators provide +10% −5% system regulation using *VARI-AMP*	$ 7,572
Maximum savings (using *VARI-AMP*)	$ 4,715

Here are the four steps needed to make this comparison:

1. Select substation size.
2. Determine percent regulation required.
3. Select proper size regulating unit based either on current or kva, and range of regulation required.
4. Compare cost of LTC portion of transformer and 3 Allis-Chalmers distribution regulators.

In this example, the substation size is 3750 kva, 164 amperes, 13,200 volts, self-cooled. Regulation required is +10% −5%.

Key to Savings is unequal range of regulation using Vari-Amp

Regulators or LTC could be provided for ±10% regulation. But there's a money saving way using *Vari-Amp* where less than ±20% regulation is required.

In this case, regulation needs are figured either on basis of setting permanent taps of transformer up 5%, or using an alternate voltage on low voltage winding to provide a 5% boost. Then only a 5% raise from the regulator is needed. The transformer raises voltage 5%; regulator raises voltage 5% . . . a net raise of 10%.

This requires regulators to carry 3750 through kva or 164 amperes at the 5% *Vari-Amp* position.

On minimum load the transformer raises voltage 5%, regulator lowers voltage 10%, which gives a net result of −5%. The regulator is allowed to go to −10% because load current has dropped below the 10% current rating of the regulator.

The selection: regulators rated 76.2 kva, 7620 volts, 160 amperes. Comparing costs shows a saving of $4715 using Allis-Chalmers distribution regulators with *Vari-Amp*.

See what you can save! Get a bid on A-C regulators next time you figure a substation. Ask your nearby A-C office for Key to Low Cost Regulation, No. A-5307, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

save $4715

and regulators

A-C ALLIS-CHALMERS

Allis-Chalmers
Originators of:

- 5/8% Step Regulators
- Unit Construction
- VARI-AMP

BLACKBURN *Hi-Strength* CONNECTORS

Make BETTER Connections — HIGH PRESSURE Connections!

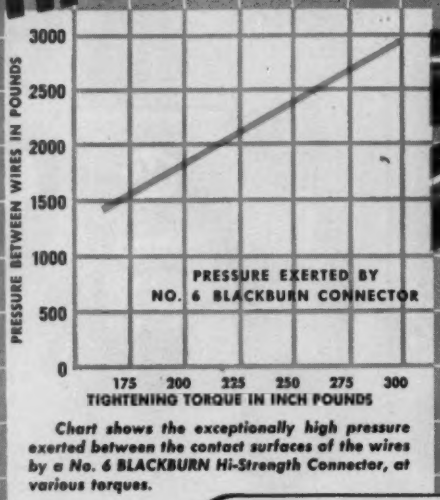


Chart shows the exceptionally high pressure exerted between the contact surfaces of the wires by a No. 6 BLACKBURN Hi-Strength Connector, at various torques.

Listed by Underwriters

HIGH PRESSURE Connections Are BETTER Connections

High pressure increases the contact area between the wires, effectively seals the contact surfaces from moisture and oxidation, and produces a lasting, low-resistance connection.

BLACKBURN Connectors Make Lasting High Pressure Connections because:

(1) They are made with the right combination of alloys — high strength alloys — to reduce frictional losses in the threads.

(2) They are made with smooth-cut threads, to increase their efficiency. These two factors insure more of the tightening torque being converted to "pressure between wires".

(3) Their corners and edges are all rounded, so that the high pressure cannot injure the wires.

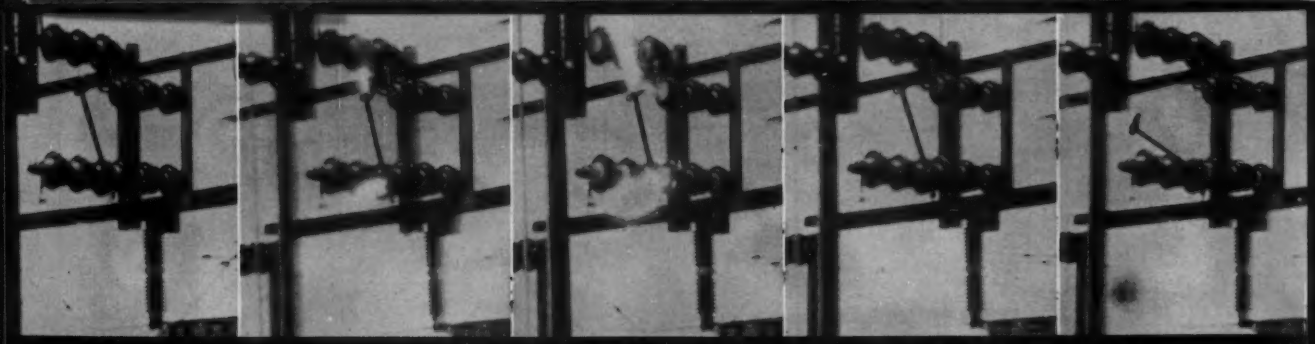
(4) They actually test stronger than other connectors when pulled to destruction in a tensile-testing machine. This means that BLACKBURN Connectors have that extra strength required to maintain the high "pressure between wires" without stretching and loosening.

(5) The coefficient of expansion of the alloys used is substantially equal to that of copper. A temperature change of 100° F results in only 1% change in the "pressure between wires".

Yes, BLACKBURN Hi-Strength Connectors definitely make *better connections — for your protection!*

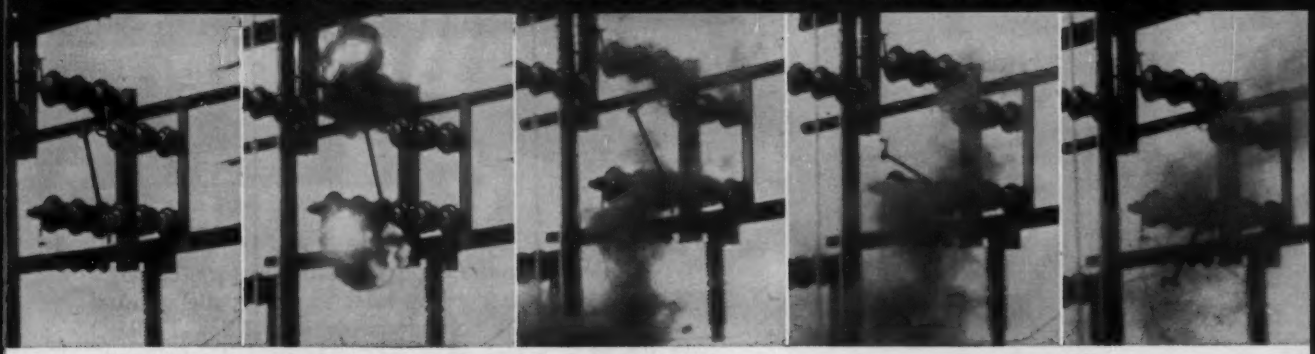
JASPER BLACKBURN CORPORATION

35 Madison St., St. Louis 6, Mo. **Phone MAin 1-2821**



LOW FAULT OPERATION This series of photos shows the Southern States HMH-1 Power Fuse clearing a fault of 288 RMS amperes. MELTING TIME: 4½ cycles—ARCING TIME: ½ cycle.

HIGH FAULT OPERATION This series of photos shows the Southern States HMH-1 Power Fuse clearing a fault of 7120 RMS amperes. MELTING TIME: 3 cycles—ARCING TIME: ½ cycle.



ACTION PHOTOS of Southern States power fuses show full-range capabilities

TYPE HMH-1

EXTENSIVE TESTS were recently conducted in cooperation with a private power company to determine the operating capabilities of Southern States' double-vented power fuses.

More than 75 individual tests were made with faults ranging in values from those just high enough to melt the fuse link to those exceeding 1-million kva. Exhaustive examinations were made of both the B Series and HMH-1 fuses in ratings from 69 kv through 138 kv.

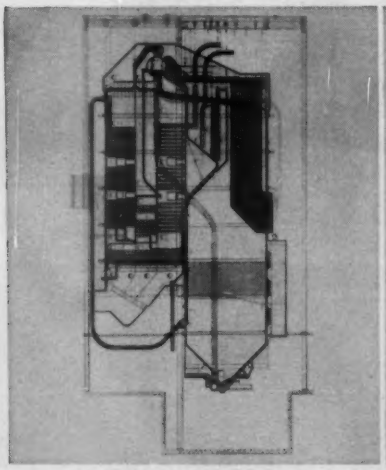
The tests demonstrated that these expulsion type, double-vented power fuses are dependable throughout the range of their ratings. Conclusions drawn from the results of these tests indicate that the interrupting ratings assigned to the HMH-1 and B Series fuses are extremely conservative.

With the many savings and advantages, including low initial cost and re-fusing costs, it will pay you to specify Southern States Power Fuses for your system.

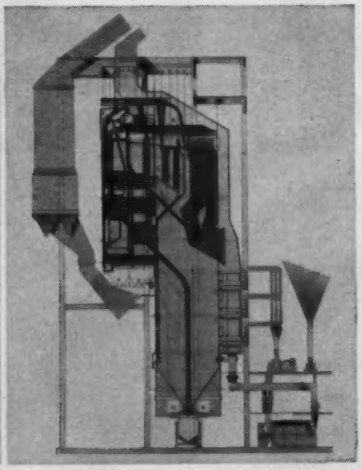
Complete information available in Bulletins 55B and 55HMH-1.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

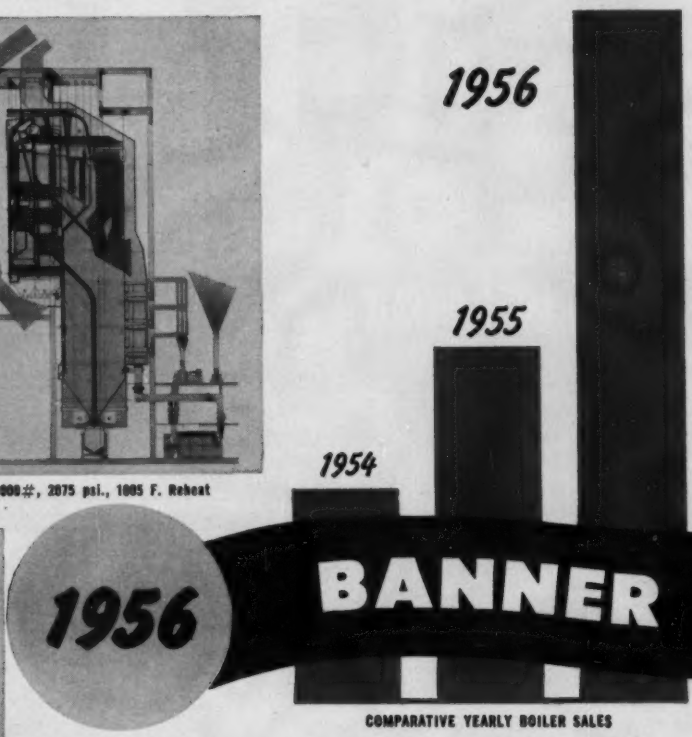
IN CANADA Dominion Cutout Co., Ltd., Toronto



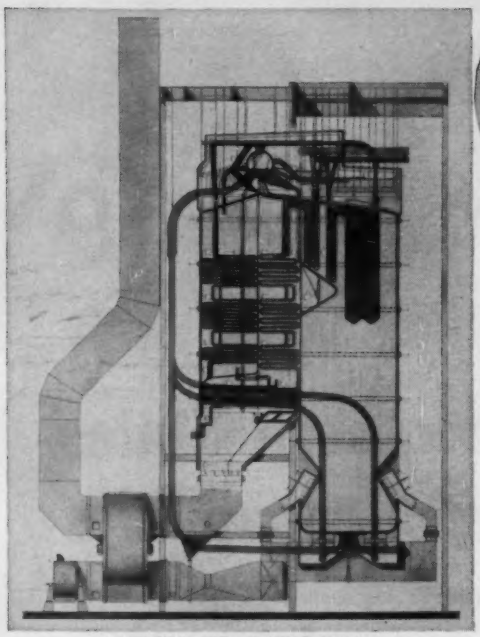
800,000#, 1700 psi., 1000 F. Reheat



1,000,000#, 2075 psi., 1005 F. Reheat



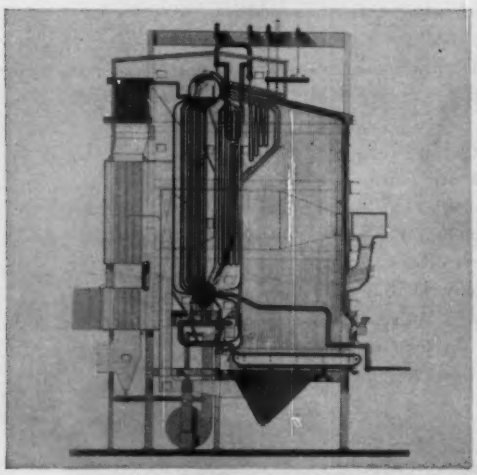
COMPARATIVE YEARLY BOILER SALES



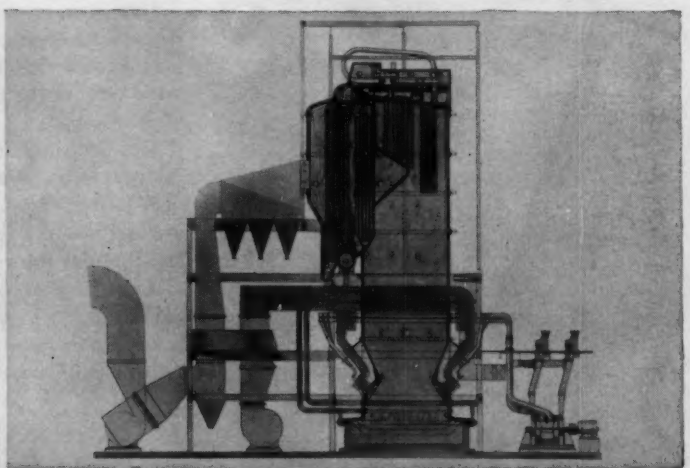
1,550,000#, 2125 psi., 1005 F. Reheat
TURBO FURNACE

1956 sales of Riley central station and large industrial type boilers were the highest in Riley history. Contributing to this outstanding sales record is the unusual acceptance of the comparatively new Riley TURBO FURNACE, a unique design that provides solutions to a number of problems associated with the economics of fuel utilization.

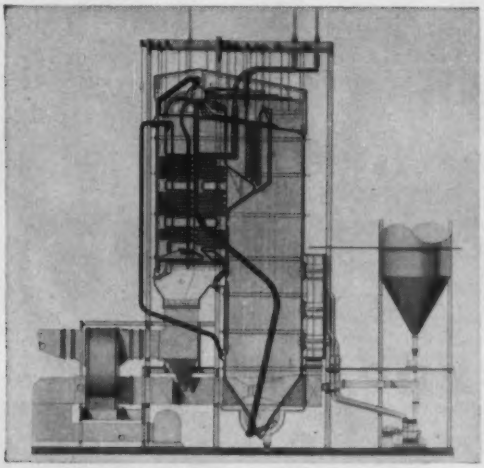
A large percentage of Riley's 1956 sales was to former customers that are completely satisfied with the continuity of operation, high rates of efficiency and dependability of Riley units purchased in the past. One prominent chemical producer ordered ten large boilers from Riley bringing its total number of Riley



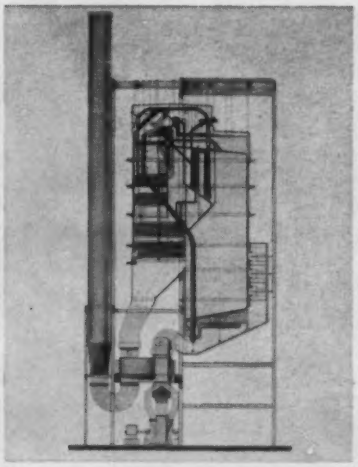
250,000#, 1025 psi., 905 F.



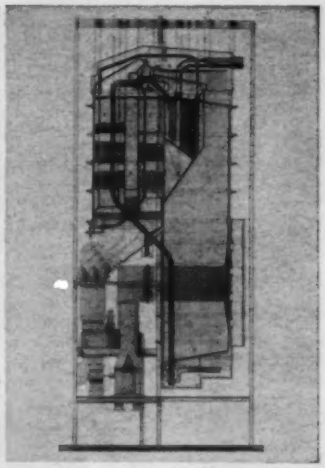
980,000#, 1425 psi., 950 F.



500,000#, 1725 psi., 1005 F. Reheat



1,050,000#, 1725 psi., 1005 F.



1,200,000#, 2125 psi., 1005 F. Reheat

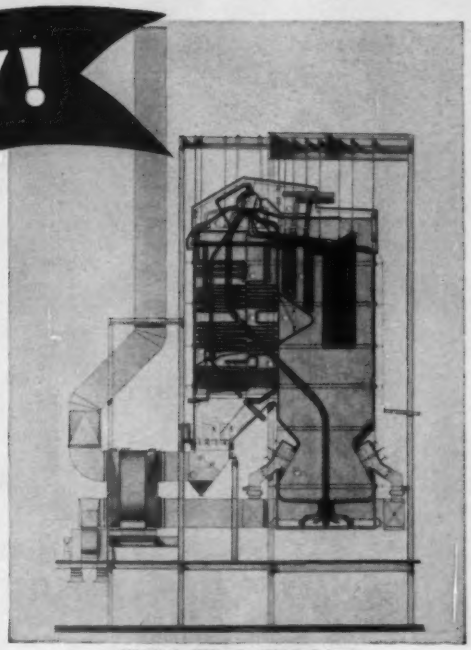
YEAR FOR RILEY!

units to thirty-six, with a total steam generating capacity of 12,775,000 pounds per hour.

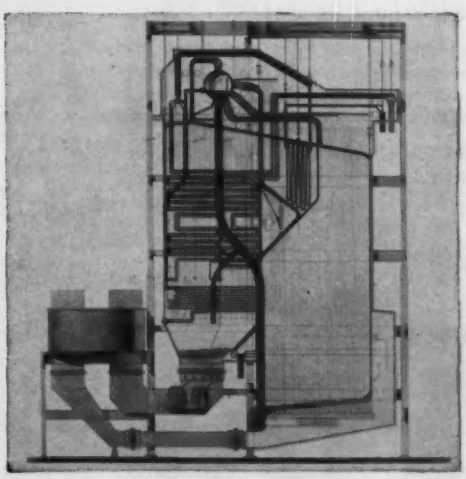
Most Riley units sold in 1956 include Riley Fuel Burning Equipment: Flare Type Burners, Riley Directional Flame Burners (with TURBO FURNACE units), Riley Intertube Gas/Oil Burners, Riley Pulverizers, Riley Spreader Stokers with Traveling Grates or with new Riley Oscillating Grates.

With today's fuel economics playing such a vital role in the selection of your steam generating equipment, you can rely on Riley for the solution to virtually any conceivable fuel situation.

Illustrations depict typical designs of Riley Central Station Units.



825,000#, 1750 psi., 1005 F. Reheat
TURBO FURNACE



350,000#, 1550 psi., 1005 F. Reheat

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

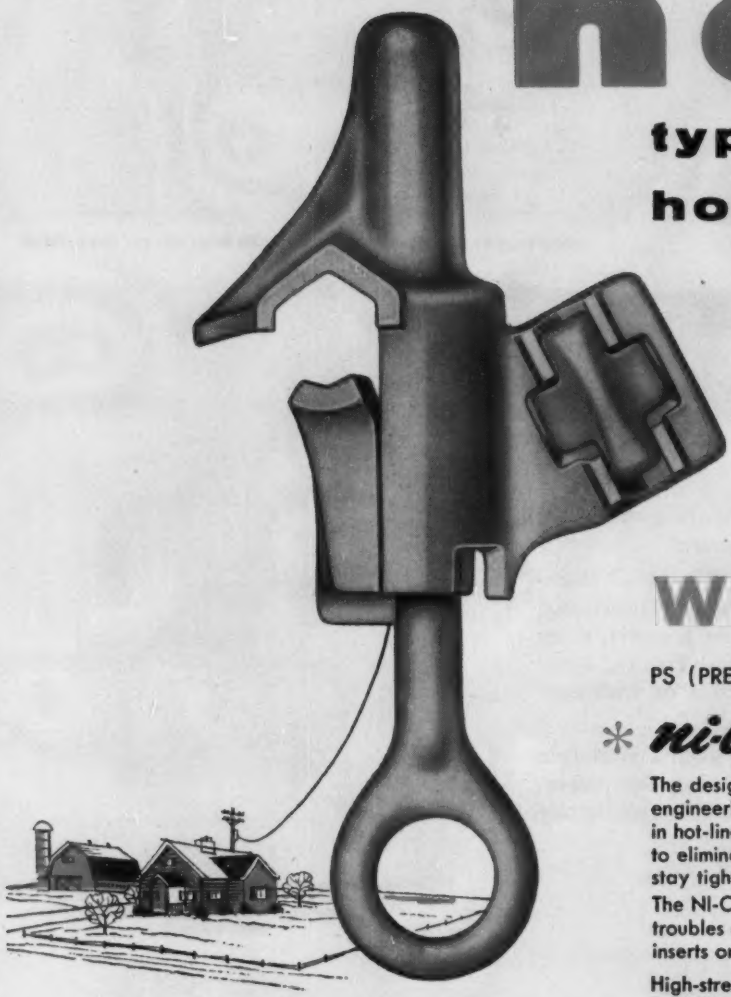
RILEY

Stoker Corporation

WORCESTER, MASSACHUSETTS

Sales Offices: Worcester, New York, Philadelphia, Buffalo, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Houston, Denver (Englewood), Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

an entirely new type of hot-line clamp



WEAVER

PS (PRESSURE SENSITIVE) CLAMPS

* *ni-cad coated*

The design is based on a proven engineering principle—never before used in hot-line clamps. This principle promises to eliminate loose connections. The clamps stay tight without springs or lock washers!

The NI-CAD coating prevents oxidation troubles on bi-metal connections . . . no inserts or pads are needed!

High-strength heat treated aluminum body. Exceptionally long wire bearing surface on both main line and tap connections. Fully lubricated with corrosion-resistant lubricant.

Non-coated PS clamps available for A1 to A1.

You stock one type clamp (2 sizes) instead of four or five.

SAMPLES ARE AVAILABLE FOR TESTING—WRITE TODAY.

* extremely heavy coating of cadmium and other corrosion resistant elements.

J. A. WEAVER Company

CE 1-8100
2110 HOWARD ST.
ST. LOUIS 6, MO.

1. Reel containing 5,055 feet of polyethylene-insulated supervisory cable being unloaded.

2. Making pig-tail splices on the polyethylene-insulated conductors. Operation took about half hour for 16-pair cable.

3. Stripping the outside jacket of vinyl. Plastic insulation and jacketing are easy to strip for fast splicing.

4. Soaping the cable to aid in pulling. Average length was 1000 feet, pulled by hand.

Worcester, Mass.—

Major utility installs polyethylene-insulated supervisory cable

These pictures show some steps in making one of the largest installations of supervisory cable for speeding location of faults in tie lines. Installation was made by Worcester County Electric Co., subsidiary of New England Power Co. It connects two substations with each other and the central generating station.

The cable has 16 pairs of No. 19 gauge conductors, each insulated with moisture-resistant BAKELITE Brand Polyethylene, with an outer jacket of tough, abrasion resistant vinyl plastic. The cable operates relays at opposite ends of the tie lines so that lines can be cleared in case of trouble.

Crews worked twice as fast as with earlier cable because the plastic construction makes this cable lighter, smaller, and easier to splice. Greater lengths were pulled through—the average was 1000 ft.—and pulling was by hand. Only a quarter of the usual splices were needed, each taking about half an hour.

BAKELITE Brand Polyethylene is being used extensively on utility line wire, service drop, power cable, and coaxial cable. It satisfies REA requirements for plastic-covered telephone wire, meets applicable IPCEA specifications for service drop cable, ASA standards for weatherproof wire, ASTM D1238-52 Type II, dielectric materials, and IMSA specifications for fire alarm and signal control cable.

Cable shown is "Ankoseal" manufactured by **The Ansonia Wire & Cable Co.**, Ashton, R. I.

BAKELITE BRAND PLASTICS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

ALL NEW DESIGN!

Simple...Foolproof...Low Cost

1500 WATT HOMELITE GENERATOR

Model 35A115
Homelite Generator
1500 Watts, 115 Volt
60 Cycle AC
90 Pounds

Easy to Carry... ...Easy to Use

1. New Money-Saving Features . . . No DC brushes; just two easy-to-get-at collector ring brushes . . . No commutator or DC windings . . . No intermediate couplings; armature keys directly to shaft. Fewer parts to wear out — longer trouble-free generator service.

2. Constant Voltage . . . less than 4% change from no load to full 1500 watt capacity . . . assures long service life for your electric tools . . . guarantees top performance at all times.

3. Overload Capacity . . . 1500 watt continuous duty with generous overload capacity prevents tool stalling under heavy loads . . . insures uninterrupted service even when starting loads exceed operating loads.

4. Compact and Lightweight . . . one man can easily carry this generator wherever you need electricity to power time-saving electric tools. No need for long, hazardous power-consuming cables.

Whatever tools you want to operate — electric soldering irons, drills, floodlights, grinders, hammers, the new Homelite 35A115 generator can save you money. For a free demonstration or additional information, call your nearest Homelite representative.

SAVE EVEN MORE! New Homelite electronic idle control unit, available as optional accessory, runs engine at idle speed when no current is drawn . . . automatically brings engine to full speed when load is applied.

Ask your Homelite representative to show you how this easily-installed accessory reduces engine wear . . . increases service life . . . cuts fuel consumption.

HOMELITE *A DIVISION OF TEXTRON INC*
6102 RIVERDALE AVE., PORT CHESTER, N. Y.
Manufacturers of Carryable PUMPS • GENERATORS • BLOWERS • CHAIN SAWS

He's rolling dielectric strength into your POLE STAR coil

Kraft paper (both adhesive-coated and untreated), laminates up to 1/32 in. thick, and other sheet insulating materials are tested by the roller-electrode method at Pennsylvania Transformer. Every square inch of surface is tested as the material passes slowly through the roller.

Here's how:

Unlike other insulation testing methods in wide use today, the roller-electrode test introduced by Pennsylvania assures accurate testing of every square inch of material. Voltage applied through the upper roll (the lower roll is grounded) converts the harmless-looking device pictured into a torture rack that is *certain* to reveal any existing weak spots — whether blisters, pin holes, inclusions of foreign matter, or some other defect in the material.

The roller-electrode test measures dielectric strength of insulation in the industry-approved units of volts-per-mil — that is, the amount of voltage that a particular thickness of a given insulating material is capable of taking without a breakdown. Rigid volts-per-mil minimum standards have been set up for insulating materials that go into Pole Star distribution transformers, and thorough testing by the roller electrode method is your guarantee that these standards are being met.

Each insulation manufacturer's material must pass acceptance tests before being approved for Pole Star insulation, after which batch checks keep the quality of the material under constant surveillance.

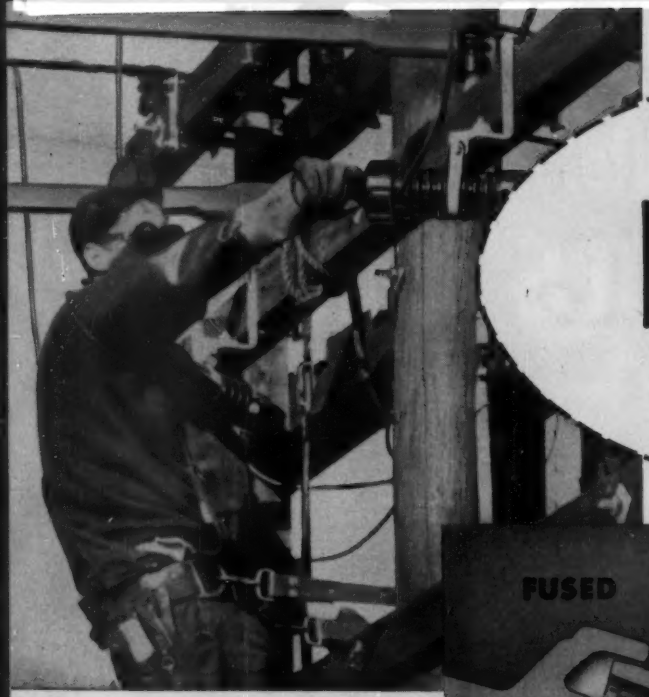
3 through 500 kva, through 67,000 volts

167 Production Controls make Pole Star Best!

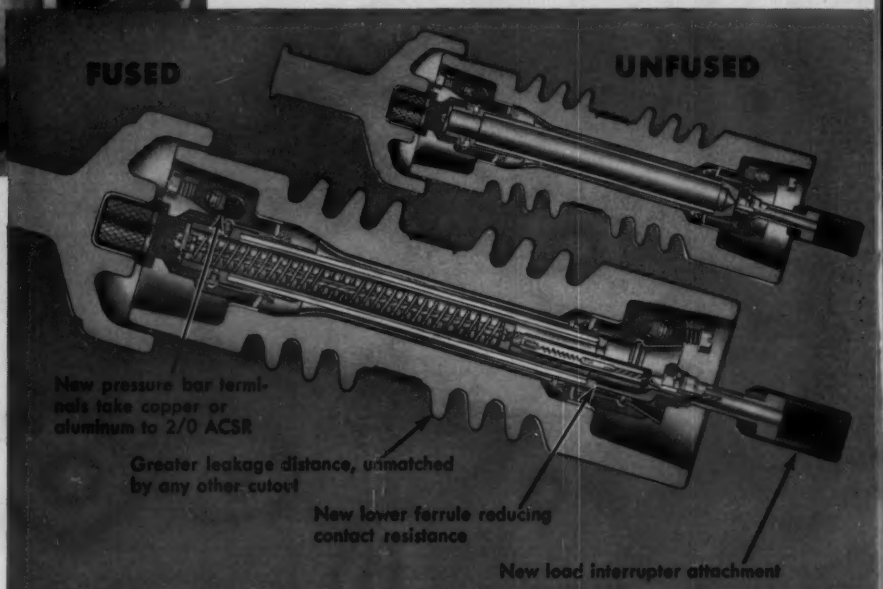
POLE STAR

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** Greater Pittsburgh District



. . . a new S&C Positect CUTOUT


FUSED
UNFUSED
New pressure bar terminals take copper or aluminum to 2/0 ACSR
Greater leakage distance, unmatched by any other cutout
New lower ferrule reducing contact resistance
New load interrupter attachment

The fused 100 ampere Positect can interrupt as much as 16,000 amperes, and can switch any steady overload it may be carrying—as much as 200 amperes with a 100 ampere link. Using a disconnect tube (upper picture) converts the Positect into an enclosed load interrupter with full 300 ampere capacity, both continuous and switching.

the only enclosed cutout for load switching . . . now with ratings to 300 amperes unfused . . . 200 amperes fused

By means of a new load interrupter attachment, the S&C Positect now provides full load switching. This new capability is designed to take care of the heavier loads on today's feeders.

The S&C Positect is the only enclosed cutout for load switching. Moreover, its action is positive. There is no external arc—no exposed hot parts. No links are broken.

Load switching capability is not the only "plus" for the Positect. For short circuit protection it's tops, too, besides having unique safety features for the lineman:

1. It is designed and tested for closing against a fault —"make" as well as "break."
2. Blast is directed away from the operator, so he is out of reach of the arc, flame and "shrapnel" in case he closes on a fault.
3. Kickback is prevented by high inertia of the fuse tube as it is driven home, directly opposing the recoil forces.
4. Blast is minimized by arc shortening and freer venting.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶ **White House specifications for a new TVA director** to fill vacancy when Dr Harry Curtis' term expires in May are difficult to fulfill. TVA Chairman Herbert Vogel will have a say in the matter when the time comes.

Nuclear power plants are going to cost more than first estimates indicate. At current Joint AEC hearings, Commissioner Thomas Murray disclosed Shippingport costs rose from first estimates of $37 million to $55 million. A study of three other cases shows rises 20% to 50% above original estimates.

LATE NEWS ▶ **Three new industry groups draft plans for building atomic power reactors.** This was revealed by AEC Chairman Lewis Strauss on opening day of Joint AEC hearings on status of civilian atomic energy program. First project would involve construction by AG&E and 11 other utilities in Ohio Valley area, of a 13,000-kw prototype with a 200,000 kw reactor to follow if small unit proves successful. Other projects are planned, although no details were furnished, by Pacific P&L for a plant near Hanford Atomic Energy Works (Wash.) and by groups of California utilities lead by Pacific G&E.

Severe blast and fire wreak $100,000 damage at a Cleveland Electric Illuminating Co substation. Explosion blew tank off oil circuit breaker and spread flaming oil on two adjacent breakers. Cause was undetermined as EW went to press.

Ohio Edison orders two additional 170-Mw turbine-generators for its Stratton plant now under construction. The Westinghouse units, costing $9.25 million, will double the plant's original scheduled capacity and raise total plant cost from $62 to $116 million. The four units will consume coal at rate of 280 tons per hour. The new station will cover 120,000 sq ft of ground area and rise to height of a 15-story building.

Threat of a power shutdown in England, Wales, and Scotland disappears, for present at least. Both Central Electricity Authority and Electrical Power Engineers Assn (representing 14,000 key CEA workers) agree to refer dispute on wages and "safety to the letter" rules to Minister of Labor.

Commonwealth Edison slates $650-million construction budget for 1957-60, largest for any 4-year period in its history. The company is filing with SEC registration statement of $50 million 1st mtge bonds due 1987. Plans to offer competitively on Mar. 1 were announced by Willis Gale, chairman.

Missouri Co-op Group urges Congress to abandon idea of increasing interest rates on REA loans and seek other source of added revenue. Members, who now pay 2%, claim a rise "would throw an additional burden on the already hard pressed farmer".

BPA's 1956 gross revenues rise to record $61 million, 17.1% over 1955. Net after interest and depreciation amounted to $6 million. Industrial revenues accounted for 46% of revenue dollar of which 33% was from aluminum industry.

Congratulations . . . Hall Henry is new president of New England Gas & Electric Service Corp succeeding the late Ralph D. Stauffer. Harding U. Greene becomes vice president and continues as VP of Cambridge Electric Light.

ELECTRICAL WEEK

A TWO-MINUTE

ATOMIC PROGRESS ▶ **First U. S. test reactor designed exclusively for power** production goes on line at Argonne Laboratory southwest of Chicago. The 5,000 kw power plant is conservatively designed and intended primarily to yield operating data that will be useful for designing commercial size nuclear power plants **(p 40)** . . . Ten Midwest utilities will use Argonne's basic "boiling water" reactor design in planning and building a full-scale 60,000 kw nuclear plant. But the utilities will add a controlled re-circulation system for feeding the turbine steam back into the reactor **(p 42).**

Still another nuclear power reactor experiment goes into operation early this year. This one, said to be the first non-military reactor in the U. S. to generate commercial power, utilizes liquid sodium as the heat transfer agent and graphite to moderate the nuclear reaction. Southern California Edison is installing a 7,500-kw turbine-generator to use a part of the reactor's designed 20 Mw of heat for power production. Diagram of steam cycle and several views of equipment being installed are a part of the article **(p 51).**

EVENTS ▶ **Sample of electric company earnings show** average net income for 1956 up about 8.5% over 1955. This is based on statements of the first 90 companies to report the full 12 months operations for 1956. Ten of the companies had a '56 net 20% or more above '55. Top growth company in the sample list turned out to be Sierra Pacific Power Co, which chalked up an unusual 36% gain **(p 44).**

New York's Gov Averell Harriman approves power contract granting 239,000 kw of capacity from the St. Lawrence project to Reynolds Metals for aluminum production, but held up approval of a contract which would grant 115,000 kw to Niagara Mohawk Power Corp **(p 47).**

GENERATION ▶ **Now they're "dry cleaning" hydro generator rotor and stator windings** with corn cob dust. Yes, you read it right. At Pacific Gas & Electric, they fill a sand blaster with corn cob dust and go to work. Not only does the new way eliminate the need for a variety of brushes and solvents, but it's reported to cut cleaning costs per machine from about $875 down to $375. Senior Hydro Engineer Hugh R. Daniel tells how it's done **(p 72).**

When the Dover (Ohio) Electric System had trouble finding space for extending six 2,000 Mcm, 5-kv cables from its new 7,500-kv generator to the city system, it used cable troughs rather than rigid conduit **(p 67).**

SYSTEM OPERATION ▶ **Boston Edison teams up digital calculator with network analyzer** to compute swing curves in transient stability studies. Using the calculator, three men can attain the same rate of solution as five or six men could with hand computation. Accuracy is improved by reduction in human errors and the feasibility of using more steps at closer intervals for the swing curves **(p 62).**

DISTRIBUTION ▶ **Ordinary paper bags are used to keep paint off bushings** when Toledo Edison's transformer department repaints a transformer **(p 72).**

SUBSTATIONS ▶ **It takes extra effort and expense to make a substation a "good neighbor,"** but electric utilities have no choice as sites become dearer both in downtown and suburban areas. Chief Station Design Engineer R. I. Powers, Wisconsin Electric Power, tells how his company has evolved substation designs to fit the neighborhood, whether it be a business, a residential, or a rural area. Pictures on the cover and in the article show outward appearance of these stations which meet exacting operation standards and have generally gained public

acceptance. To meet noise complaints, WEP has purchased transformers with one step of noise reduction, and one design has provided complete enclosure. "As a last resort," writes Powers, "baffles may be used to assuage a serious complaint **(p 58).**

SELLING ▶ **"Live Better . . . Electrically" promotion program is going great guns.** That's the gist of first annual report beamed on closed circuit television to 53 cities across the country. In New York, "Parade" Editor Arthur Motley praised success of the program but warned that aggressive salesmanship is needed to follow up promotion . . . The magazine, "Better Homes and Gardens," sponsors an adequate wiring contest for electrical contractors **(p 83)** . . . Adequate home and duct insulation as well as adequate capacity units are top requirements when heat pumps are used in 4,500 to 5,000 degree-day areas . . . Home development project in Chicago offers electric heating to new home buyers **(p 84).**

MANAGEMENT ▶ **Number of electric company security offerings picked up momentum** last week after several weeks of doldrums **(p 105).**

Pricing of electrical equipment can be a warm topic for discussion when a manufacturing "accountant" meets a utility purchasing agent. For a brief rundown of such a discussion and a report on other happenings at the recent Public Utility Buyers Group meeting in Louisville, see **(p 48).**

PEOPLE ▶ **Thomas F. Peterson,** president of Preformed Line Products Co, wins Cooper Union's Gano Dunn Medal for outstanding achievement . . . John J. Burke, board chairman of Metals Bank & Trust Co of Butte, Mont., is new president of Pacific Northwest Power Co. He succeeds Kinsey M. Robinson, president of Washington Water Power Co, who now also becomes board chairman at PNP . . . A. Clay Stewart and William A. Duncan, Jr, become vice presidents at Kentucky Utilities **(p 116)** . . . W. B. Shenk is named general sales manager and M. F. Bunnell is named manager of industrial relations at Florida Power Corp **(p 118).**

MANUFACTURERS ▶ **Price boosts of approximately 5%** have been announced by Allis-Chalmers on all station type and distribution feeder voltage regulators effective as of Feb. 15. Also list prices of 2,500-v distribution regulators were raised to bring them in line with prices for the 5,000-v class . . . Three 5,000-hp, 3,600 rpm, drip proof, super-quiet induction motors, said to be the largest units for boiler feed pump drive supplied to a utility in this country, were shipped to Detroit Edison for its No. 3 unit at the River Rouge Station . . . McGraw-Edison's 12-state network of new research laboratories will include a short circuit lab for transmission and distribution equipment at Milwaukee **(p 111)** . . . Extendable soot blowers used in conjunction with de-slaggers help Philadelphia Electric attain more precise regulation of temperature for steam generator units No. 1 and 2 at its Cromby Station **(p 112).**

NEW EQUIPMENT ▶ **Six hundred amp interrupter** which can be mounted on new or existing vertical break air switches is available. It is claimed that addition of interrupter to existing switches will not change electrical clearances, phase spacing, or performance under adverse conditions . . . A stored energy mechanism to operate Magne-blast circuit breakers with metal-clad switchgear is on the market in ratings of 4.16 to 13.8 kw with interrupting ratings from 150 mva to 750 mva inclusive. It's intended for use on utility or industrial power systems . . . Novel attachments for pole diggers make it possible to work under low lines or close to obstructions **(p 88).**

ENGINEERING TRENDS

A new record in cooling towers is foreseen in the order placed by Central Electricity Authority for towers to match five 200-Mw turbine-generators scheduled for its High Marnham (England) station. A tower will be erected for each turbine to cool 6 million gal of water per hour from 87 to 70F during atmospheric conditions of 55F dry bulb of humidity. From a 266-ft diam base, these towers will rise 349 ft above the pond bottom.

Co-existence of utility wires and shade trees will again be the subject of the Street Tree and Utility Conference at Cleveland, March 7-8.

Radition safety problems may require about 3% increase in personnel in large-scale nuclear power operations, according to D. F. Hayes of the American Management Association

Utilizing liquid metal in a double-reheat fuel-fired steam plant boosts turbine gross heat rate 1.2%, but annual savings realized are insufficient to justify the added investment, according to study reported by "Combustion." A 300-Mw, 5,000-psi, 1,150/1,050/1,050F machine was considered. Reheating for it used sodium-potassium to transport heat energy from the boiler to steam reheaters adjacent to the turbine. This arrangement reduced steam pressure drop in the reheat system, cut the cost of reheat piping, and eliminated the reheat stop valves. Future developments, such as using low-alloy feritic material for the liquid metal system, providing one liquid-metal system for two turbine-generator units, eliminating reheat intercept valves, or a reduction in the cost of the liquid metal itself, may make the arrangement more attractive.

FROM EDITORS IN THE FIELD

Shield wires are returning to favor for subtransmission pole lines. Latest endorsement of their ability to decimate lightning outages is demonstrated by Consumers Power Co's comparison of the performance of 2,594 mile-years of shielded 46-kv wood-pole lines, which use the insulating value of wood to boost critical impulse level over 400 kv, with the performance of 3,026 mile-years of typical unshielded lines of about 310 kv impulse strength.

Substation main buses will be supported from cross buses below, using inverted V's to join them, instead of being supported by insulators on steel structures. South Carolina E&G Co estimates savings from this innovation at $6,000, will use aluminum tubes for buses and V's and join them by welding.

Connecticut River water powers six hydroelectric plants of the New England Electric System as it flows 150 miles in about 24 hours. Completion of the 150,000-kw Samuel C. Moore plant boosts the system's generating capacity in this distance to 400,000 kw.

Microwave takes on relaying, telemetering, and control functions, in addition to customary voice communications, in new systems planned for installation by Public Service Co of New Mexico and Southern Nevada Power Co.

High-Voltage Pin-Type Insulator. This and all other Illinois Insulators are available with radio and TV noise-proof glaze in standard production.

TRIPLE-TESTED
To Assure Top Quality

At Illinois Electric Porcelain Co. the manufacture of electric porcelain is no longer an art or simply a skilled craft. New standards of material testing, manufacturing controls, and rigid final tests have made porcelain manufacturing a scientific production procedure.

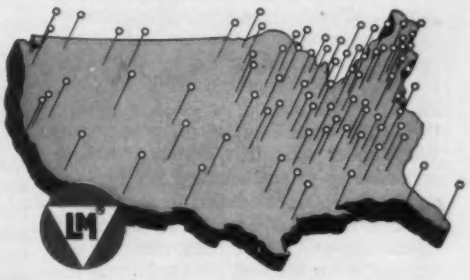
By triple-testing as set up by Illinois, we mean: (1) incoming materials are tested in a new, complete ceramics laboratory; (2) quality control during manufacturing assures uniformity and compliance with high standards in molding, pressing, drying, glazing, and firing processes; (3) rigid mechanical and electrical tests to destruction are made on a representative quantity of the finished product. The result is a product the user of Illinois porcelain can depend on for uniformity, consistently high strength and insulating value.

The high-voltage pin-type insulator shown is available in EEI-NEMA ratings 56-1, 2, 3, 4 for 23, 34.5, 46 and 55 kv with radio noise-proof glaze as standard.

Illinois Electric Porcelain products include pin and suspension insulators, strain insulators, switch and bus insulators, hardware and fittings.

For fast service, just pick up the phone now and call your nearest L-M office. Or ask your L-M Field Engineer for complete information and a copy of Bulletin DL8; or write Line Material Company, Milwaukee 1, Wisconsin.

67 L-M Warehouses... there's one near you!

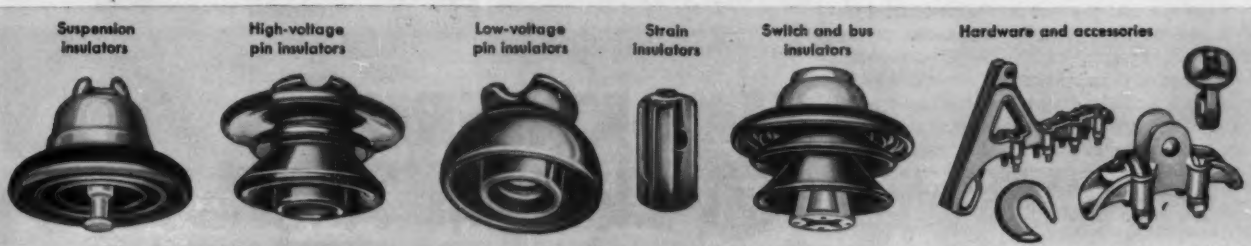


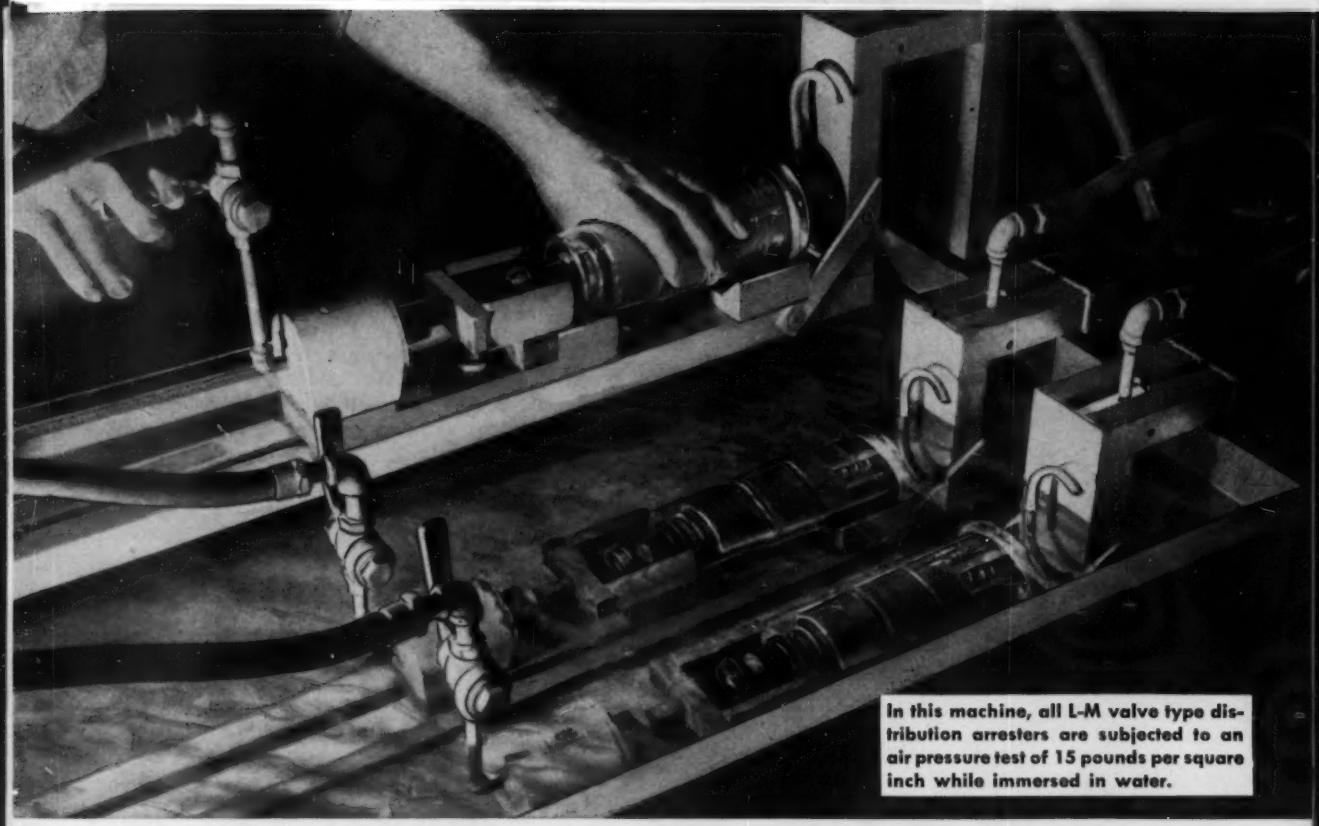
ILLINOIS ELECTRIC PORCELAIN COMPANY
(a McGraw Electric Company Subsidiary) Macomb, Illinois

Distributed by **LINE MATERIAL** *Electrical Porcelain Insulators*
A McGRAW ELECTRIC COMPANY DIVISION

285

L-M offers an extensive line of suspension and strain insulators, and hardware accessories





In this machine, all L-M valve type distribution arresters are subjected to an air pressure test of 15 pounds per square inch while immersed in water.

How L-M's Type E Valve Arresters Are Pressure-Tested For Positive Sealing

By **M. L. FENNIG**
Application Engineer
Protective Equipment
Line Material Company

All of L-M's valve type distribution arresters are pressure-tested to assure a positive seal against moisture. After the arrester is assembled, except for glass cap and wire lead, air under 15 pounds pressure is applied through a small V-cut in the copper cap. While under pressure, the arrester is held under water to see whether any bubbles appear, indicating air leaks. Since the valve material is porous, this air pressure test checks the gaskets at both ends of the arrester. After the test, air pressure is released, the opening is solder-sealed, the lead and the glass cap are attached.

Heavy Seals At Each End

Top of the arrester is sealed by a heavy synthetic-rubber gasket between the copper cap and the seat on the housing. Pressure on the gasket is maintained permanently by spinning the copper cap over a flange on the glass housing, while the assembly is under pressure in a hydraulic press.

The bottom of the arrester is also sealed by a heavy synthetic-rubber gasket which is held in place against the glass seat and compressed by the Isolator assembly.

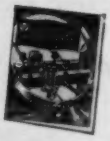
Visual Testing In Field

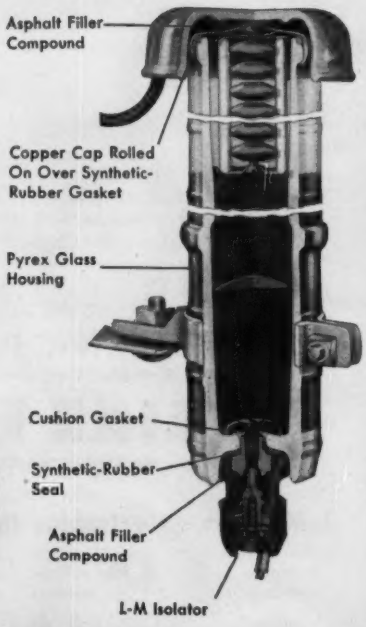
No electrical testing is required to determine the condition of L-M's Type E valve arrester, because it is in a *glass* housing. Visual inspection is the complete test! Should the spark gap be damaged by any cause, permanent telltale evidence can be readily seen through the Pyrex glass housing. In the rare cases when the valve element may be damaged by overvoltage or direct strokes, or the spark gap fails to extinguish power follow current, the Isolator will operate.

L-M's Isolator gives positive assurance against grounding feeders by disconnecting the ground lead from the arrester if the arrester should ever become damaged. It also provides the lineman with a visual indication of a damaged arrester.

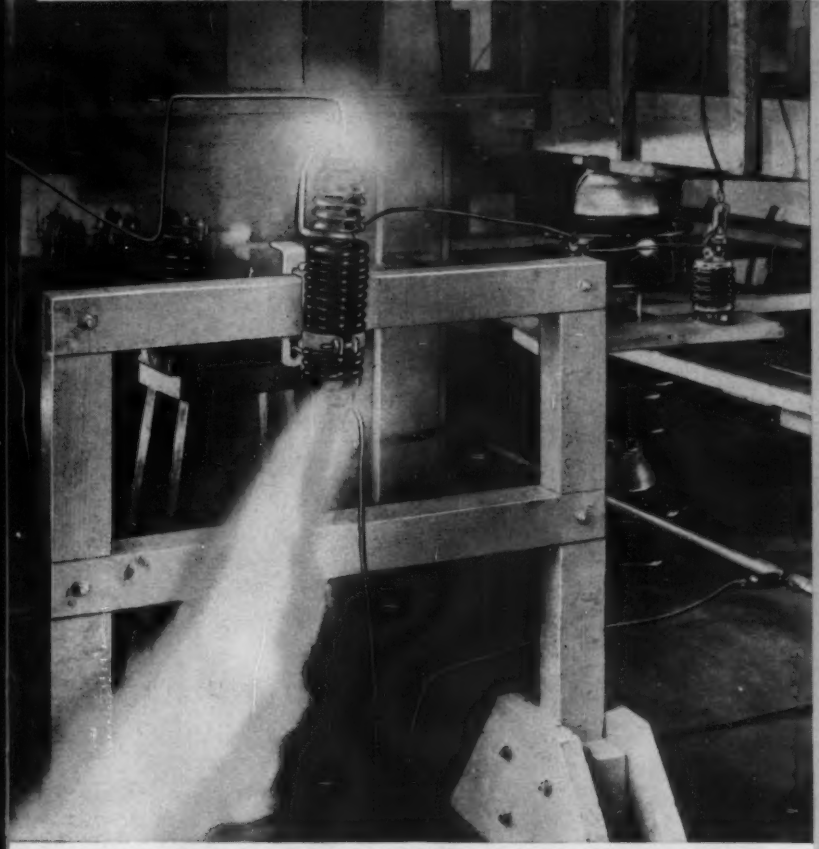
Ask For Complete Information

Ask the L-M Field Engineer for Bulletin LA2 on L-M's Type E arrester, giving specific information on arrester requirements, design and performance; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

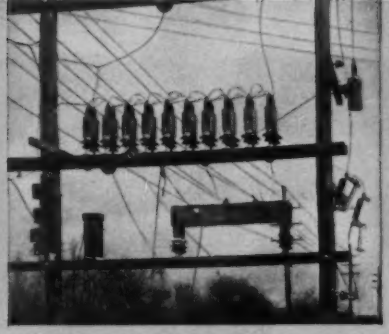




LINE MATERIAL
Lightning Arresters



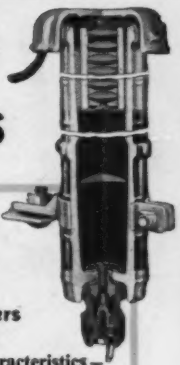
A LARGE NUMBER OF BLOWN FUSES WERE TRACED TO EXPULSION ARRESTERS. Photo shows one of the tests conducted by L-M engineers with the utility engineers that placed responsibility for the outages on the expulsion arresters.



EXTENSIVE FIELD TESTS were made by one utility to prove that *expulsion* arresters were satisfactory. But the evidence was the other way; the company continues to use *valve* arresters exclusively.

MANY COMPANIES ARE SWITCHING TO VALVE ARRESTERS because valve arresters provide a higher degree of protection. One company not only switched to valve type, but replaced every expulsion arrester on the system. Picture above shows lineman replacing an expulsion arrester with a valve arrester.

Why Valve Type Lightning Arresters Are Better Than Expulsion Arresters



By **GEORGE W. COOPER**
Product Manager
Protective and Power
Switching Equipment
Line Material Company

Line Material is frequently asked, "Which arrester principle is best for my system?" The answer is provided by operating companies who have tested and proved through field experience that *valve arresters are better than expulsion arresters.*

Regardless of differences in design by various manufacturers, there are certain basic differences in the valve *principle*, as compared with the expulsion principle.

The valve arrester operates on the principle of a valve, which "opens," with low resistance to high-voltage, high-current lightning surges, and "closes," with high resistance to 60-cycle follow current.

The expulsion arrester operates on the pressure principle, of expelling the power follow current arc. For this purpose fibre is used to form the gases which expel the arc. This fibre is subject to erosion—and changing characteristics. These limitations apply regardless of differences in design, manufacture, etc.

Listed at the right are four principal reasons why we recommend valve type arresters over expulsion arresters.

Get Complete Information

Details of some of the extensive evidence in favor of valve over expulsion arresters are given in a new booklet, "The Theoretical and Practical Aspects of Lightning Protection for Distribution Systems." Whichever type you use, we believe you'll be interested in this report. Ask your L-M Field Engineer for a copy, or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

FOUR REASONS for recommending valve over expulsion type arresters

1. Better Protective Characteristics—The valve arrester sparks over more quickly and at lower voltages on lightning surges.

2. Unlimited 60-Cycle Capacity—The application of the valve arrester is not limited by the available short-circuit current.

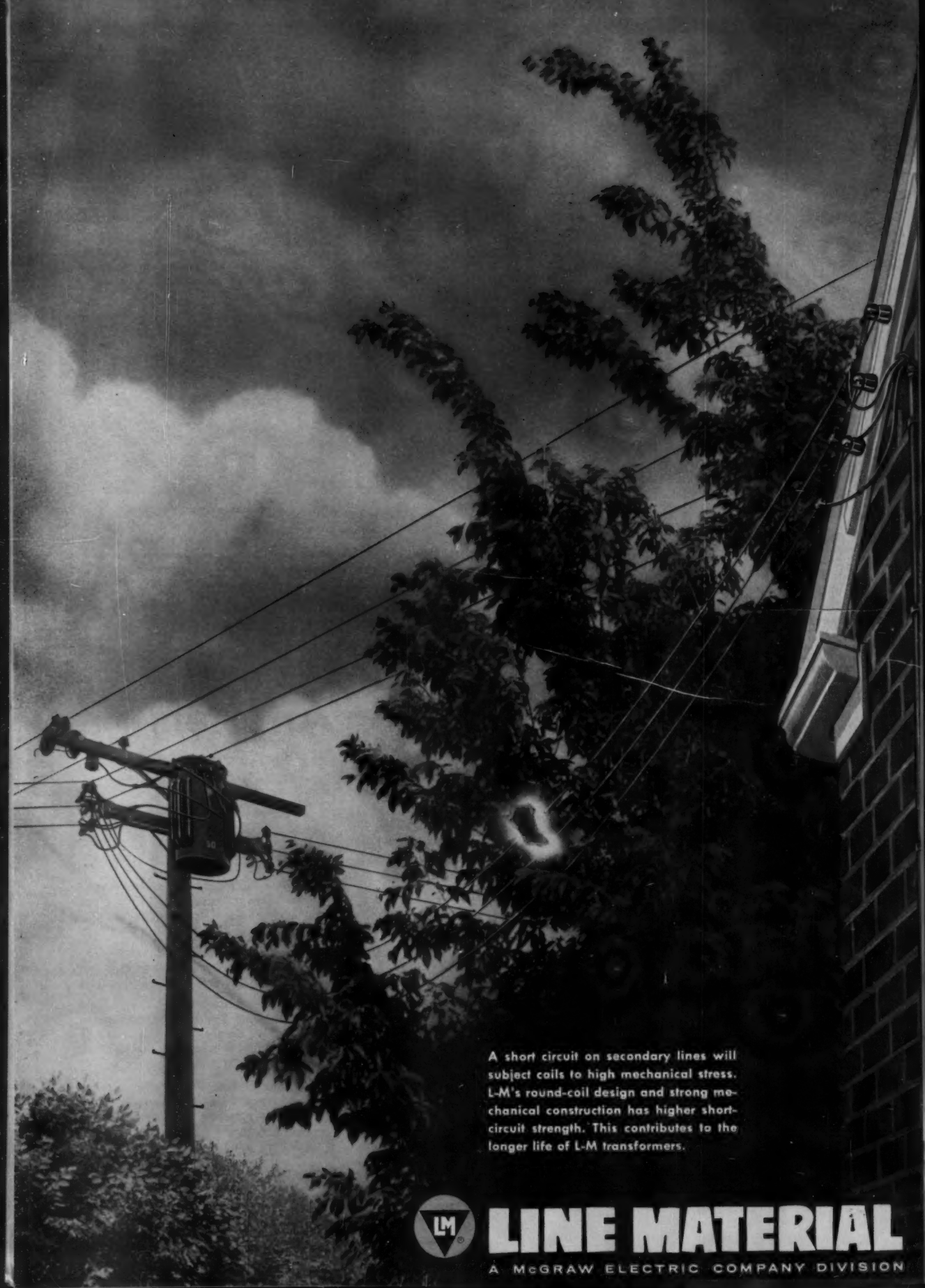
3. No Fuse Coordination Problems—The valve arrester will pass relatively small values of 60-cycle follow current, regardless of system capacity.

4. Longer Life—The valve arrester is electrically and mechanically unaffected in handling lightning discharges usually encountered in service. Its life is relatively unlimited.

259

LINE MATERIAL Lightning Arresters

A McGRAW ELECTRIC COMPANY DIVISION



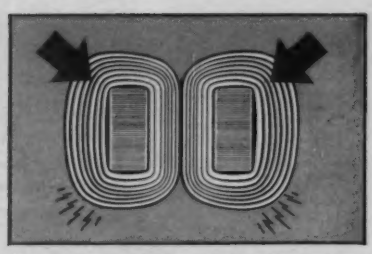
A short circuit on secondary lines will subject coils to high mechanical stress. L-M's round-coil design and strong mechanical construction has higher short-circuit strength. This contributes to the longer life of L-M transformers.

LM

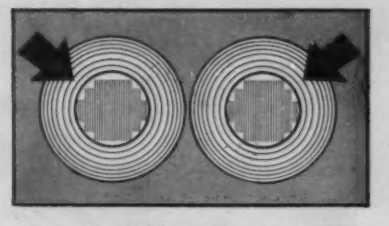
LINE MATERIAL

A McGRAW ELECTRIC COMPANY DIVISION

Small core-coil assemblies are removed from varnish dip, ready for curing ovens. Varnish is limited to a few outer layers of the coil and a short distance in from the coil ends. This adds mechanical strength, which is achieved while still permitting complete oil impregnation throughout the coil. In large transformers, where forces are greater, core-coil assemblies are completely vacuum-impregnated with varnish.



Rectangular Coils: Under short circuits, rectangular coils tend to distort to a round shape; are subjected to insulation damage or even complete failure of the coil.



Round Coils: Since the coils on Round-Wound transformers are already round, short-circuit currents produce little or no radial distortion in the coils.

Here's Why L-M's Round-Coil Design Insures Higher Short-Circuit Strength

Another big reason why more customers are specifying L-M Round-Wound® Transformers

By **ALBERT C. WURDACK**
Chief Engineer
Large Distribution Transformers
Line Material Company

An important feature of a transformer is its ability to withstand the mechanical forces created by heavy short-circuit currents. The round coils of L-M's Round-Wound transformer and its mechanical construction have an important effect on minimizing these internal stresses.

Round Coil Design

When rectangular coils are short-circuited, the heavy currents tend to force the windings into circular shape. The coils are therefore subject to physical distortion, which may result in damage to the insulation or even complete failure of the coil.

But round coils, already circular, are not stressed out of shape. The radial forces are distributed evenly with little or no effect on the coil.

Strong Mechanical Construction

L-M's core clamping structure utilizes rugged formed steel channel and clamping bolts. Sturdy, oil-impregnated maple blocks at top and bottom are tightened and clamped against the coil ends to prevent axial movement.

In addition to strong blocking and clamping, L-M has developed an excellent varnish application. The varnish has high bonding strength to resist short-circuit mechanical shock. It has high resistance to oil, will not dissolve in or contaminate the oil in long-term service. The varnish can be cured at low temperature, avoiding insulation damage.

Thus round coils, plus rugged mechanical construction, give Round-Wound transformers higher short-circuit strength and longer life.

For More Information

Ask the L-M Field Engineer for more complete information and bulletins on L-M's Round-Wound transformers. Or write Line Material Company, Transformer Division, Zanesville, Ohio.

Five Reasons Why More Customers Are Selecting L-M Round-Wound Transformers

1. Higher Uniform Impulse Level: Round coils are *wound* into shape. Therefore insulation is not damaged by malleting into rectangular shape. Coils have longer creepage distance between windings and between leads.

2. Higher Short-Circuit Strength: Round coils are not stressed out of shape under high radial short-circuit forces. Strong steel frame, heavy clamping bolts, sturdy maple blocks and varnished coils prevent axial movement.

3. Higher Short-Time Overload Capacity: Round coils and the cruciform cross-section core expose large surfaces to cooling oil. The result is relatively low hot-spot temperatures, which add considerably to high short-time overload capacity.

4. Balanced Performance: The core is a continuous wound strip of oriented steel. Coils are wound directly onto this core. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This results in low exciting current and core loss.

The wound-core, round-coil design permits fewer winding turns and smaller turn diameter. This results in low impedance, and provides better regulation at all power factors.

5. Additional Capacity on Pole: L-M's new obround tank design makes the unit smaller and lighter, with shorter moment arm from the pole. This combination reduces the bending moment on the pole and crossarms, and thus greatly increases the potential capacity of existing transformer structures.

Transformers

Photo courtesy Public Service Electric and Gas Company of New Jersey

J-M Transite Ducts go in quickly, easily and permanently

Quick, low-cost installation is promoted by Transite Ducts. The light, 10-foot lengths are easily handled . . . and readily joined with either Transite Couplings or J-M Plastic Couplings. Many fittings are available to simplify even the most complicated installation. The permanently smooth interior surface of these asbestos-cement ducts prevents cable injury, makes long pulls possible and simplifies cable replacement.

Incombustible Transite Ducts confine arc damage, protecting adjacent cables from heat and flame. Inorganic, nonmetallic, Transite Ducts are corrosion-resistant, immune to rust and rot and unaffected by electrolysis. These ducts dissipate heat faster, reducing I^2R losses, enable cables to carry heavier loads and prolong insulation life.

Available in 2 types: Transite Conduit for exposed work and installation underground without concrete encasement; and Transite Korduct for installation in concrete.

Let us send you more information about Transite Ducts.
Just write to Johns-Manville, Box 14, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE® DUCTS

TRANSITE KORDUCT®—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

*

THE KOREA TIMES

KOREA'S FIRST ENGLISH DAILY NEWSPAPER

Seoul, Republic of Korea

—EDITORIAL—

ALL NIGHT LIGHT SUPPLY AND CURFEW LIFT

In view of boosted electric power production, the Ministry of Commerce and Industry reportedly is contemplating a test operation, furnishing electric power to homes without restriction. It is now expected that a 24-hour power supply will be made available within two months.

Thus the oil lamps and candles will soon disappear from sight and we can enjoy bright nights. Government public offices and factories also will have a 24-hour power supply.

MASAN

SAMCHOK

TANGIN-RI

*Symbol of U.S. partnership in mutual security programs.

HANDS ACROSS THE PACIFIC

Under U.S. International Cooperation Administration sponsorship, Bechtel designed and constructed three steam-electric power plants for the Republic of Korea, nearly doubling that country's available generating capacity. Overall time for the plants, from grass roots to on-the-line, was less than two years.

BECHTEL CORPORATION • *Builders for Industry*
SAN FRANCISCO
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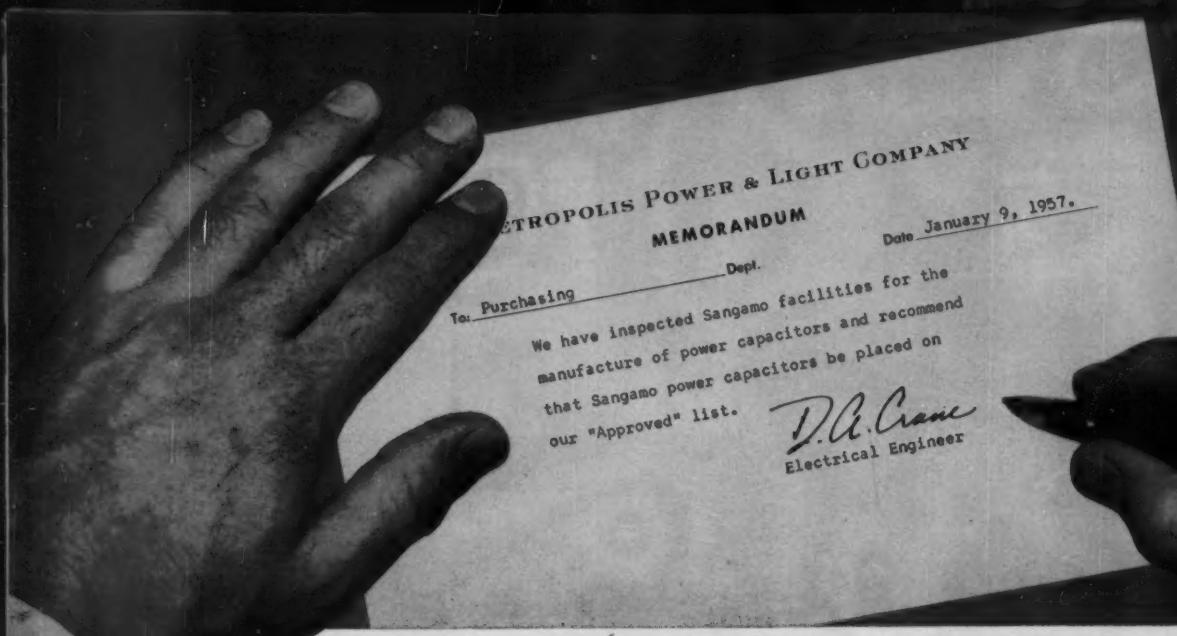
BECHTEL


ETROPOLIS POWER & LIGHT COMPANY
MEMORANDUM
To: Purchasing Dept.
Date January 9, 1957.
We have inspected Sangamo facilities for the manufacture of power capacitors and recommend that Sangamo power capacitors be placed on our "Approved" list.
D. A. Crane
Electrical Engineer

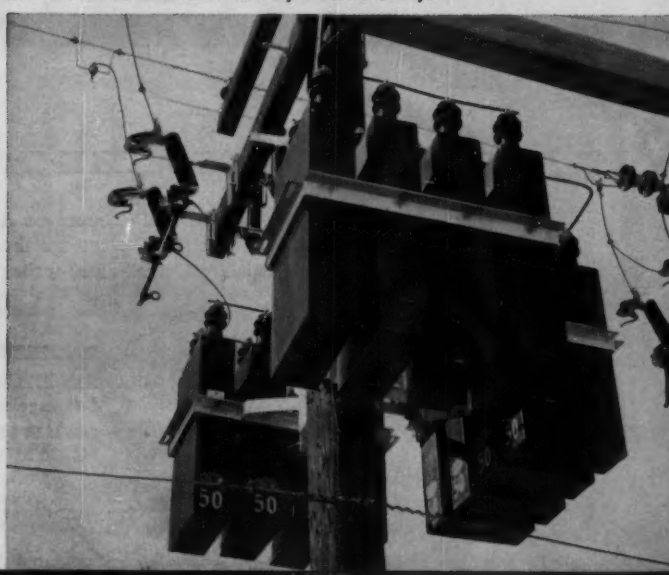
SANGAMO CAPACITORS RATE "APPROVED LIST" of most

PC57-1

Engineers responsible for the purchase of power capacitors want to *know* how capacitors are made, what's inside them, and why they give assurance of meeting specific service requirements.

To provide this information first-hand, Sangamo, over the past two years, has had its power capacitor processing facilities inspected by engineering personnel of many

This cluster mount of twelve Sangamo 50 Kvar Capacitors is part of a bank installed at a substation by a Texas Utility.



Group of engineers inspecting Sangamo manufacturing methods. Here they see how bushings are sealed to case by induction soldering.

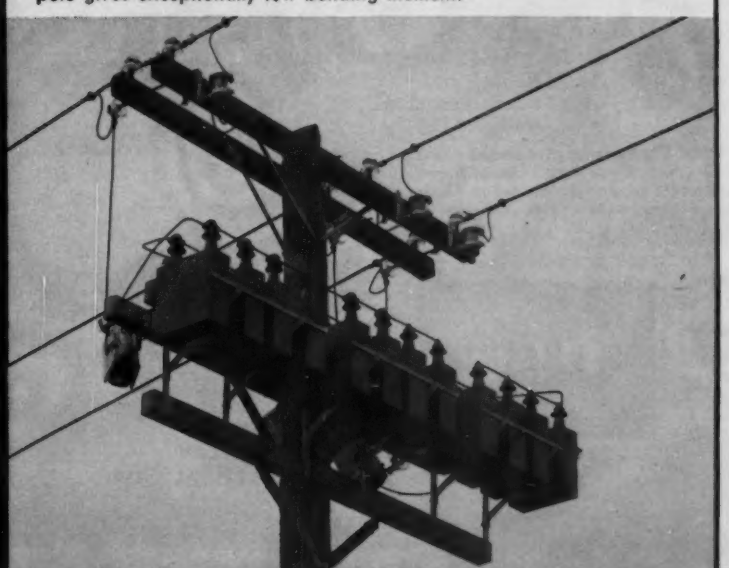
major utilities

major utilities. These engineers have placed Sangamo Power Capacitors on the "Approved List" of their respective companies.

Sangamo invites you, also, to investigate its facilities, inspect its plants, and use its capacitors. Ask your Sangamo Representative, or write us for complete information.

SANGAMO ELECTRIC COMPANY, Springfield, Illinois

Twelve unit in-line Auto Var Capacitor Equipment. Close coupling to pole gives exceptionally low bending moment.



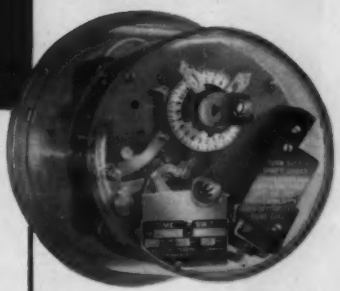
Look to SANGAMO for Capacitor Controls

TO FIT YOUR NEEDS...

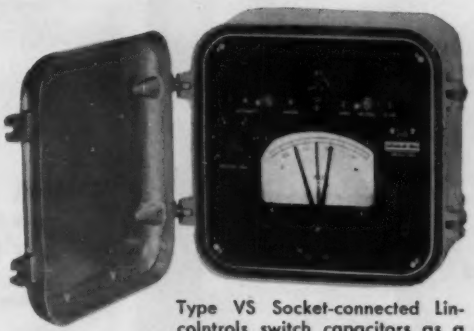
Whether you control capacitor switching as a function of Time, Amperes, Volts, Watts or Vars —Sangamo can furnish economical and reliable control equipment.

Sangamo Time Switches for automatic capacitor switching on predetermined time schedules.

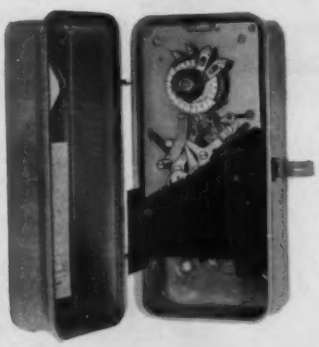
Sangamo Lincolntrols for automatic capacitor switching in response to changes in circuit conditions.



Type WS Synchronous-Carryover Time Switch for socket mounting.



Type VS Socket-connected Lincolntrols switch capacitors as a function of voltage.

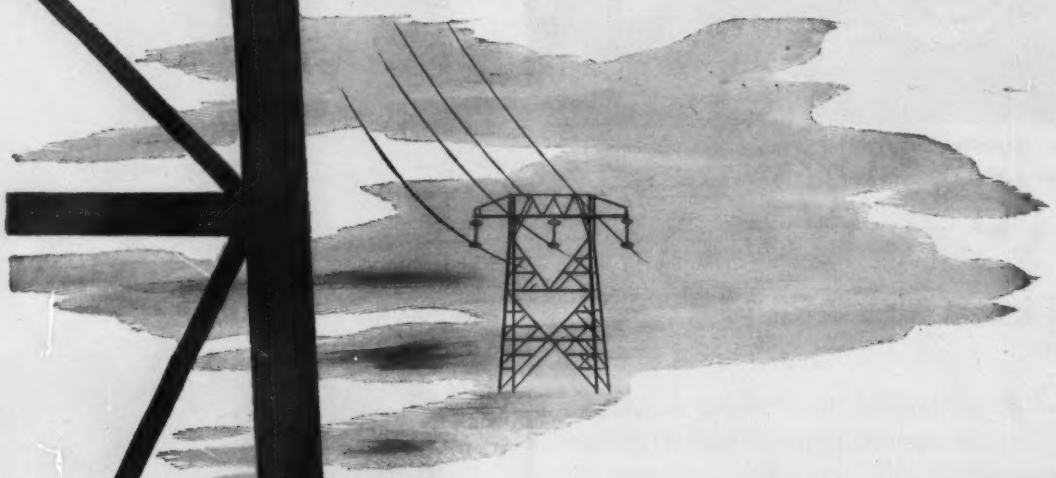


Type L Synchronous Time Switch in pressed-steel case with knockouts for conduit connections.

Type AW Synchronous-Carryover Time Switch includes fuse and switches for manual and automatic operation.

How Ebasco helps
the electric power industry

KEEP SALES AT HIGH LEVELS



ARE YOU now realizing the greatest sales potential from your market area?

ARE YOU developing the demand for additional electric service through proven promotion methods?

ARE YOU using sales techniques that help keep the load evenly distributed throughout the year?

ARE YOU employing a program that will maintain favorable public opinion?

The answers to these questions are vital to the future growth and prosperity of your company. And Ebasco, with long experience in all phases of utility operation, is able to supply them. Ebasco specialists will study markets and trends, will offer tested advertising and promotion ideas, will help with your sales organization structure, public relations program and sales training.

Backed by over 50 years of association with utilities of all sizes, Ebasco can provide a skilled, objective viewpoint to supplement the activities of your own personnel.

To find out what Ebasco sales and public relations service can do for your company to keep sales at high levels write for our booklet—"The Inside Story of Outside Help". Address Ebasco Services Incorporated, Dept. M., Two Rector Street, New York 6, N. Y.

Ebasco Teamwork gets things done anywhere in the world

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EBASCO
BUSINESS CONSULTANTS

Appraisal • Budget • Business Studies
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Insurance, Pensions & Safety • Purchasing • Rates & Pricing • Research
Sales & Public Relations • Space Planning • Systems & Methods • Tax • Traffic
Washington Office

STANOLITH Grease gives coal a smooth ride

Over 5,000 bearings need just one grease. Never a bearing lubrication failure.

Part of the coal for the Wabash River Generating Station operated by the Public Service Co. of Indiana near Terre Haute, comes directly from the Viking Coal Mine Processing Plant via a conveyor system. The system operates 365 days a year moving up to 4,800 tons of coal per day. STANOLITH Grease has been used to lubricate all bearings in the conveyor system since February 3, 1953, the start up day. In all that time there has never been a bearing lubrication failure.

Prior to the initial operation of the conveyor system, maintenance supervisors checked with Paul Manning, Standard Oil industrial lubrication specialist, about lubricating the new installation. Paul, they knew, has extensive experience (21 years) in handling lubrication problems of this kind. Working with plant management, Paul recommended STANOLITH Grease No. 42 for the job. STANOLITH Grease has fulfilled maximum expectations.

STANOLITH Grease is a smooth textured grease. It is made from highest quality oil, lithium soap and special additives. It resists water washing and water contamination. STANOLITH Grease works well in exposed, outdoor installations. It will not channel. It is chemically stable. It can be applied easily by hand, gun or pressure system.

Find out more about STANOLITH Grease. Talk to your Standard Oil industrial lubrication specialist. There is one near you in any of the 15 Midwest or Rocky Mountain states. Or write 910 South Michigan Avenue, Chicago 80, Illinois.

***Quick facts about* STANOLITH Grease**

- Water resistant
- High temperature resistant
- Pumpable in grease gun or pressure system
- Mechanically stable

STANDARD

STANDARD OIL COMPANY

Part of coal conveyor system at Wabash Power Plant, Terre Haute. Entire conveyor is lubricated with one grease —STANOLITH. No bearing failures experienced during the 3½ years conveyor has operated.

Butyrate conduit is so light that one man can easily lift six 20' lengths, 2" in diameter.

Slip-sleeve couplings and solvent cement join lengths of Butyrate conduit quickly and permanently.

Butyrate conduit can be covered with concrete or subjected to any normal backfilling operation.

Butyrate's resistance to corrosive and electrolytic attack permits installation even in strong alkali soils.

Flexibility of Butyrate conduit permits it to follow ditch contours without the use of fittings—even a 90° bend, as here.

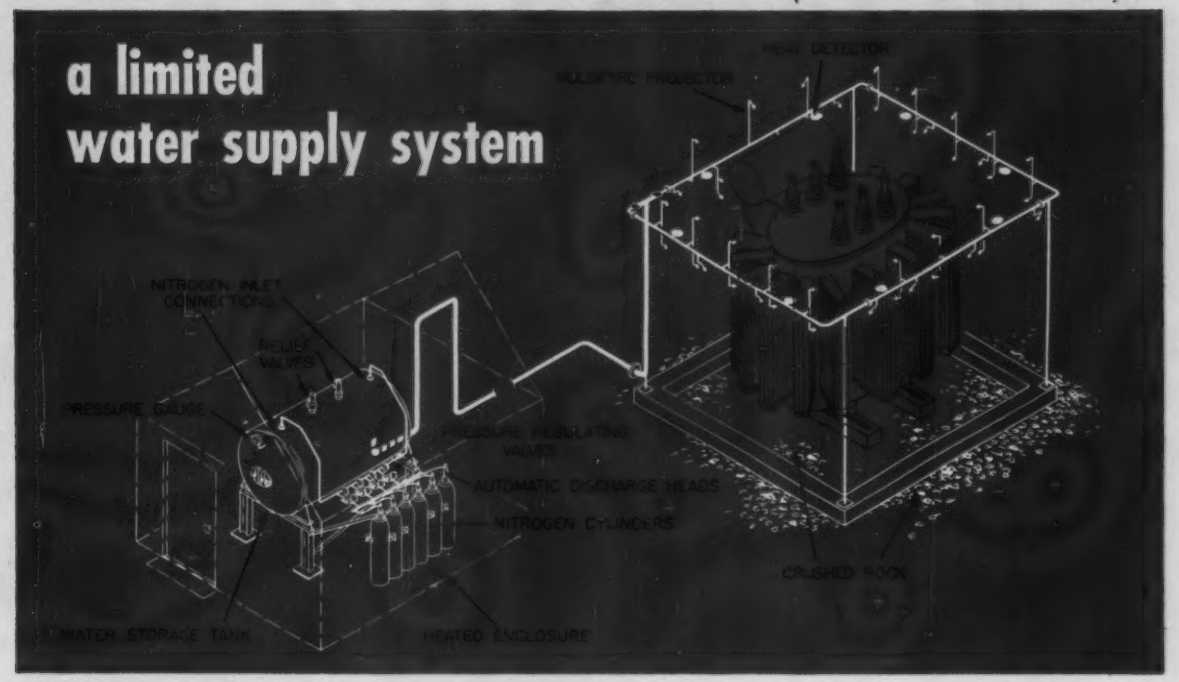
Specify Tenite Butyrate cable conduit for faster, easier installations that last longer

Cable conduit made of Tenite Butyrate offers you these specific advantages over ordinary conduit: It can be handled, cut and joined with ease and can be bent around most obstacles – which means that installing conduit for power lines and telephone cable need no longer be a long or expensive process. It has an impact strength often lacking in other materials and in service, is unaffected by corrosive or electrolytic action of soil – your assurance of long years of trouble-free service.

Find out how cable conduit of Tenite Butyrate can save you time, labor and money. For more information and the names of manufacturers supplying Tenite Butyrate conduit, write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE
BUTYRATE
an Eastman plastic

NOW!
Grinnell SELF-CONTAINED Mulsifyre Protection

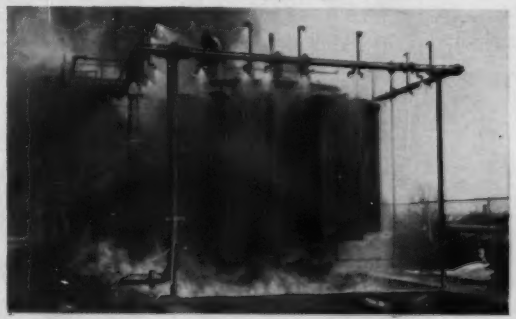


You need no longer be without water spray protection simply because your hazard is distant from city water mains. Grinnell's new *Self-Contained* Mulsifyre System provides automatic detection and prompt water spray protection in extinguishing fires while still small, and in preventing their spread with possibly serious damage.

Water spray protection, of course, presupposes water under pressure. Grinnell's *Self-Contained* System successfully achieves this through the use of nitrogen gas, stored in cylinders under high pressure, which drives the water from the storage tank at spray-forming velocities. As with all Grinnell Fire Protection Systems, the component parts of the Self-Contained Mulsifyre System are fully listed by Underwriters' Laboratories and meet specifications covered in NBFU Standards 13 and 15.

Your particular hazard will be thoroughly analyzed by the Grinnell Fire Protection Division, which introduced water spray protection in America — and has the widest possible background experience in its use. Full consideration will be given to the property to be protected, as well as to all other adjacent exposure hazards.

Let a Grinnell Fire Protection Engineer tell you more about this system. Grinnell Company, Inc., 252 West Exchange Street, Providence, Rhode Island. Branch offices in principal cities.



Grinnell *Self-Contained* Mulsifyre System successfully operating to extinguish fire under test conditions

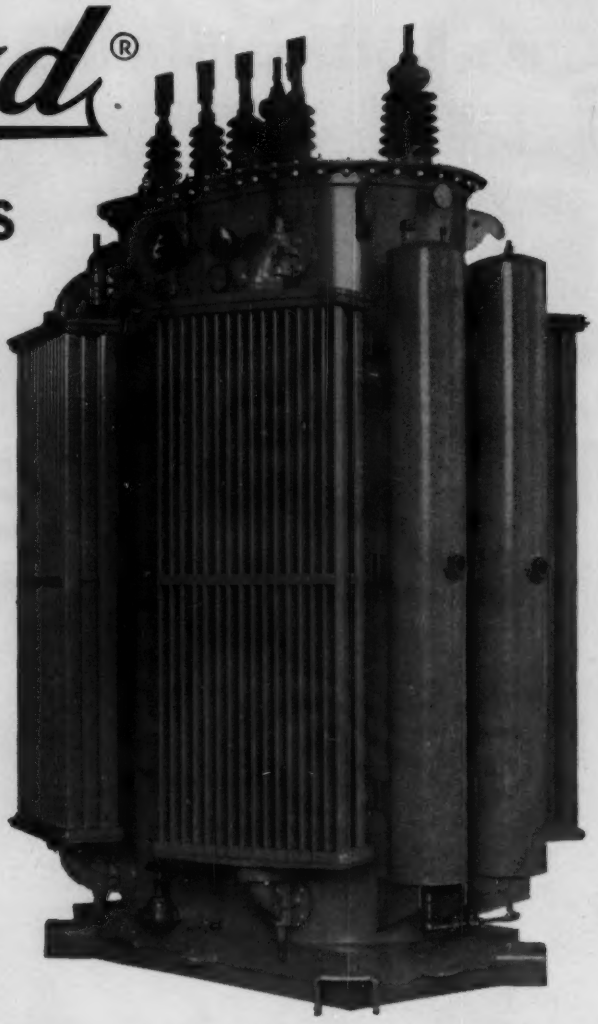
GRINNELL *Mulsifyre*

EMULSION EXTINGUISHMENT OF OIL FIRES

Standard®

POWER TRANSFORMERS

efficient . . .
economical . . .
dependable



2500 KVA, single-phase, OISC power transformer, 34,500 volts primary, 2400x4800 volts secondary. Special design to meet customer's specifications. Standard engineers will work with you to meet your requirements.

● Where power requirements demand above-average reliability and efficiency, Standard Power Transformers are your one best choice. Figures taken from service records show how Standard's sound engineering principles cut maintenance costs to the bone and boost transformer life.

Standard engineers work with your engineers to incorporate the transformer design features and specific components that meet your needs most efficiently. Bushings, tanks, finishes, covers, and accessories meet ASA specifications and are rigidly inspected by Standard. Each transformer, regardless of size, is subjected to all standard commercial tests—both during and after manufacture.

We can build transformers to your specifications as quickly and economically as if you'd bought repetitive designs.

There's a Standard Transformer representative near you. Call him. He'll work with you to produce the best transformers you've ever used.

Standard®

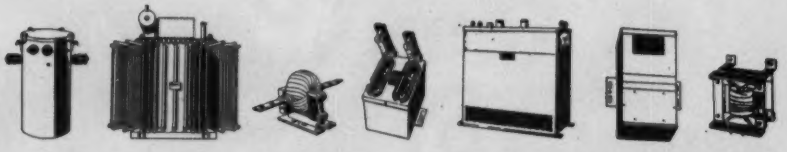
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Transformers

FOR EVERY APPLICATION



Self-Contained Strength

SAVES MONEY!

All Auxiliary Supporting Structures Eliminated When You Use THOREX Lightning Arresters

All the way -- even above 300 kv -- Thorex lightning arresters are totally self-supporting. No external bracing or superstructure of any kind is needed. Every model is a clean, simple, un-cluttered column.

This is at no sacrifice of strength. Even largest Thorex arresters offer generous safety factor over all recognized requirements for wind resistance and earthquake shock. The smaller, more popular sizes, multiply this safety.

Consider the savings resulting from this self-contained strength. No auxiliary support structures or massive foundations need be built. No bracing insulators need be purchased. No time need be wasted building, adjusting, and aligning external supporting members.

And, with all this simplicity, all this cost saving, you get in addition a protective device meeting or exceeding every published standard, and having added features not elsewhere available. For a bargain installed price you get a premium product!

Is Thorex in your plans for your next station construction? It will be well worth your while to check the specifications and be sure of getting the most for your money.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4774-H

RIGHT NOW!

Dependable HyperCore Transformers . . .
Available Where You Need Them—
When You Need Them!

Strategically Located Warehouses Assure Immediate Delivery from Stock

You get dependable HyperCore Transformers . . . when you need them . . . because Moloney has warehouses with adequate stocks throughout the country. Each warehouse is strategically located, too, and filled with transformers of all ratings and types. Because there's a warehouse *near you,* dependable HyperCore Transformers are available . . . RIGHT NOW . . . in any quantity, rating or type you desire. MEB8-0

Specify Moloney . . . Get Dependable and Superior HyperCore Transformers . . . the best made . . . for your utility.

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Transformers • Network Transformers • Industrial Dry Type Transformers • Load Tap Changing Transformers • Regulating Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Series Street Lighting Transformers • Subway Transformers • Capacitors • Magnetic Components For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

A Program for Progress in Insulation Coordination

"In this dynamic and expanding world the competent engineer has to lead a dynamic and expanding life. There is simply no room left for any routine approaches to engineering, or for standing still with the mental equipment we have. The engineer has to grow and change with the times. He has to nourish his mind and broaden his outlook to make sure that neither gets obsolete. And always he must look ahead."

Thus—in the blunt, forthright language of an engineer—Frederick R. Kappel, president of American Telephone and Telegraph Co, spelled out the responsibilities of the engineer today in an address before the AIEE.

Using equally forceful and direct language, he told industry that it too bears a responsibility to the engineer to provide the training and environment necessary for growth.

"There remains to industry the great responsibility to provide not only first rate technical training but also to make sure the able engineer never gets locked in his technical closet.

"For people of ability, who have real proprietary interest in the business they are in and who want to make their interest affective in action, industry must provide full opportunity for education and growth.

"We won't do it by just tagging or labeling people as engineers. We won't do it by putting engineers into compartments and shutting them off from the rest of the ship. We won't do it by cramming size 42 men into size 36 jobs or vice versa. We won't do it by setting so called minimum standards and then sitting back and letting nature take its course."

Industry can do this if it will exert intelligent and concerted efforts to develop engineers with "height"; —what Kappel called "three dimensional" engineers —who have been technically well-educated, broadened through continued training and self-study; engineers who have attained the "height" that comes from mixing and mingling engineering and management ideas so that the engineer's understanding of the problems and needs of industry make them more effective.

As we see it, what Kappel has said so simply is that engineers *must* grow, that technological progress is demanding in its reliance upon engineers, that it isn't something that we can just look forward to with pleasant anticipation. Engineers must grow to meet it. Industry can provide a favorable environment for this growth, but in the end it is engineers themselves who must do the growing. No one can do it for them.

Whatever Isn't Growing Wears Out

Insulation coordination has made substantial progress in the quarter century since it was first applied. Through a carefully guided process of technical evolution, it has today reached a high degree of development.

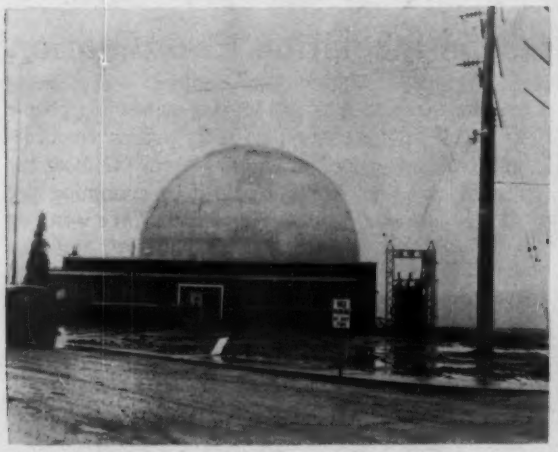
Savings in equipment cost that have accrued to the industry from its application have been substantial. American Gas & Electric Co, for example, estimates first cost savings from one-step reduction of transformer impulse level on its 132-kv system alone at $2½ million over the past two decades. Opportunities for a $½-million saving on main power transformers for a 450-Mw turbine generator have been foreseen through 2-step reduction of BIL.

Substantial as these savings and progress have been, there is still much to be done, particularly in protecting equipment against over-voltages.

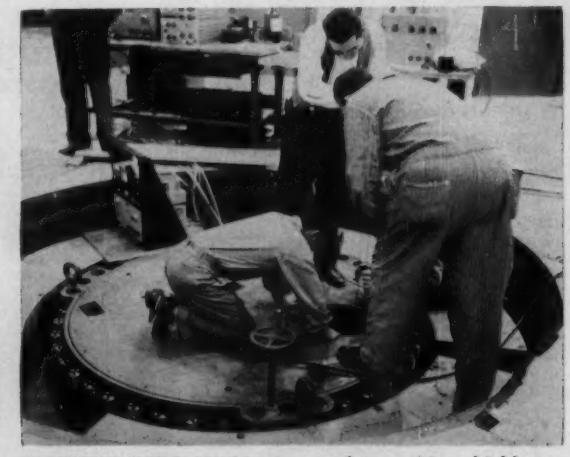
Areas where research and development are needed to perfect present practices and open opportunities for further savings were clearly mapped in a classic AIEE paper by Philip Sporn and I. W. Gross, American Gas & Electric Co, pioneers of insulation coordination. They pointed out that:

- Thermal ability of arresters—ability to pass repeated or long-time surge currents, such as switching surges—has not been given much consideration recently.
- As lines get longer and stored energy in them increases, it becomes much more important that arresters be able to discharge repeated switching surges.
- Not enough is known about the characteristics of switching surges, and, consequently, not too much is known about their effect on insulation. It is a field that today needs even further exploration than it is now receiving.
- Agreement is needed on the value of lightning current discharge to obtain the greater protective level which is to be coordinated with the BIL.

It is obvious that further investigation is needed to realize benefits of insulation coordination already in sight. A coordinated attack on these areas where new knowledge is needed is the best guarantee that progress already achieved will continue.

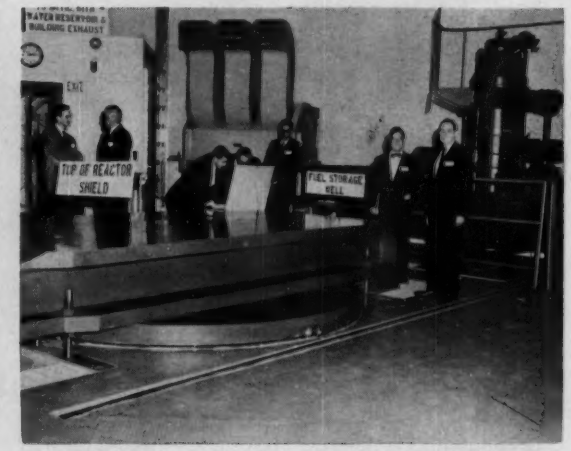


ARGONNE'S Experimental Boiling Water Reactor is housed in steel shell. Controls and offices are in exterior building



ECCENTRIC SHIELD PLUGS were used to position shield over desired hole while fuel was being inserted into the reactor

CONTROL ROOM activity was televised on closed-circuit hookup as unit went on line so all could see the ceremony



REACTOR'S TOP is covered by 6-in.-thick steel plate under beams that are designed to restrain and deflect "forces"

Argonne's Power Reactor Comes "on Line;"

- **Rated at 20 Mw, the reactor now will drive a 5-Mw generator, although performance tests indicate that it might be able to power a 10-Mw machine**

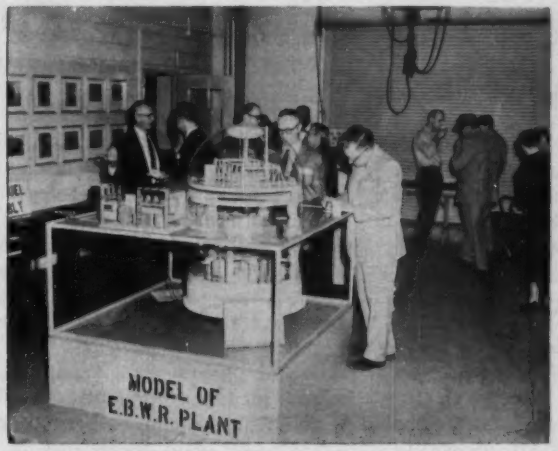
- **Inquiries now will be directed toward the unknowns of day-in, day-out operation**

Argonne National Laboratory's new Experimental Boiling Water Reactor (EBWR) was "put on the line" Feb. 9, for normal, or what utilities call commercial, operation in ceremonies held at the plant. This is the first nuclear reactor designed and built in the Western Hemisphere exclusively for the generation of electric power for peaceful purposes. Argonne Laboratory is southwest of Chicago.

Rep Carl T. Durham (D-N.C.), chairman of the Joint Committee on Atomic Energy, flipped the switch that put the generator "on the line" to supply service to Argonne Laboratory. Atomic Energy Commission Chairman Lewis L. Strauss took part in the ceremonies.

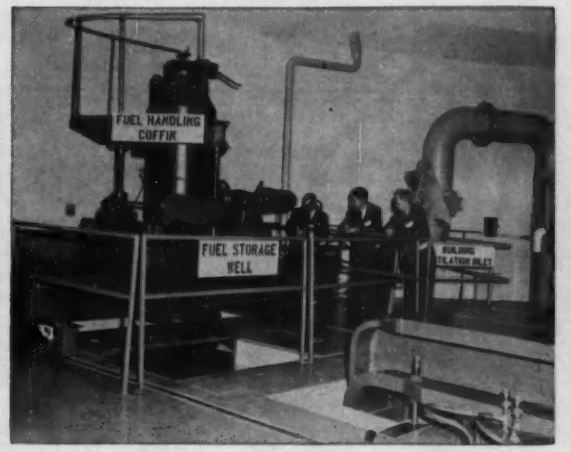
Among others on hand were representatives of firms that supplied equipment, contractors who participated in the plant's construction, and consulting engineers who designed it.

The reactor first became critical Dec. 1. It was brought up to the full 5,000-kw capacity of the generator for the first time on Dec. 29. Recently, it has been undergoing

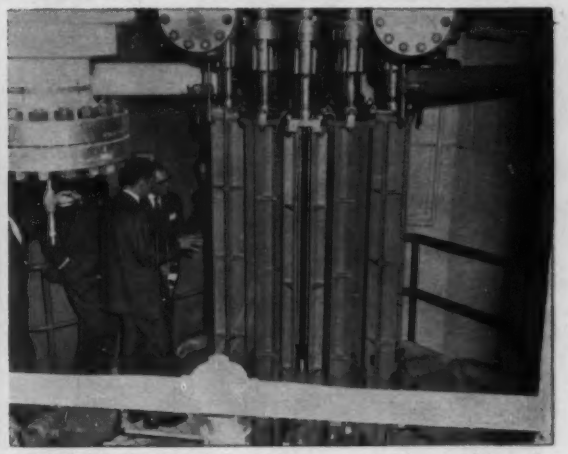


DURING OPEN HOUSE, delegates inspected EBWR model. Generator is on the ground level; reactor is underground

REP CARL T. DURHAM, chmn, JCAE, puts unit on line. L. A. Kimpton, U. of Chicago and AEC's Lewis L. Strauss watch



THIS FUEL COFFIN is used to transfer "hot" fuel elements from the reactor to a nearby storage pit filled with water



ON LOWER FLOOR, nine reactor control rods are driven by these devices below reactor; pipe stubs are for further use

Is to Yield Operating Data

varied tests and adjustments.

The 5,000-kw generator operates at 4,160 v. Steam generated by the reactor passes directly to the turbine. No intermediate heat exchanger is used.

The reactor design was intentionally conservative because of limited knowledge of such equipment. However in test operation, performance has been so promising that experts indicated the reactor probably could power a 10,000-kw machine.

Steam is generated in the reactor at 600 psig and 488F. The saturated steam then passes from reactor vessel to the turbine through a steam dryer.

During operation, cold feed water at 110F is pumped into the reactor vessel where its temperature is raised to 488F at a pressure of 600 psig. Reactor core power is 20Mw. Steam generation rate is 60,600 lb/hr.

Fuel Costs $1-Million

The fuel assembly contains six tons of slightly enriched uranium. It cost $1-million. The reactor's support plate and core shroud will hold up to 148 fuel assemblies, in the 5-ft-diam space. The present core, 4 ft in diameter, has 114 assemblies. Of these, 106 contain enriched uranium (1.44% U^{235}), and eight contain normal uranium. Average enrichment of the entire assembly is 1.4% U^{235}. Dummy assemblies fill out the core.

Nine control rods of two types are used in the reactor. In five rods hafnium is the neutron-absorbing material. The other four rods are made from stainless steel containing 2% boron.

Because the reactor is experimental, an unusual amount of flexibility was incorporated in its design. The 4-ft-diam core can be increased

up to 5 ft. Fuel elements of different dimensions were provided to permit changing the water-to-uranium ratio in the core and studying the influence of steam void coefficient of reactivity on reactor stability. Two enrichments of uranium allow the critical size of and power distribution pattern in the core to be varied.

Moderator May Be Changed

Although designed to use light water as a moderator and to use natural circulation cooling, the reactor may be converted in a year to a heavy-water moderator and forced circulation. Natural circulation is at 7,000 gpm. Forced circulation may yield a 10,000-gpm flow. The heavy water core is expected to have high velocities that will make forced circulation pay.

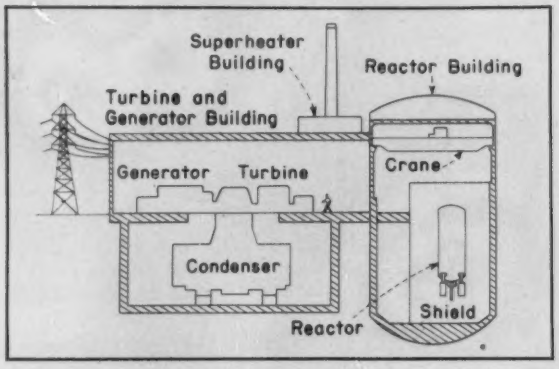
Experimentally, boiling water reactors have been shown to have an unusually high degree of inherent safety. Steam in the reactor reduces reactivity. If a control rod is withdrawn, permitting reactivity to increase, the extra steam generated tends to reduce the reactivity.

Nevertheless, the reactor was encased in a steel shell to safeguard against contamination of the surrounding atmosphere in case of an accident which would release radioactive material within the power plant.

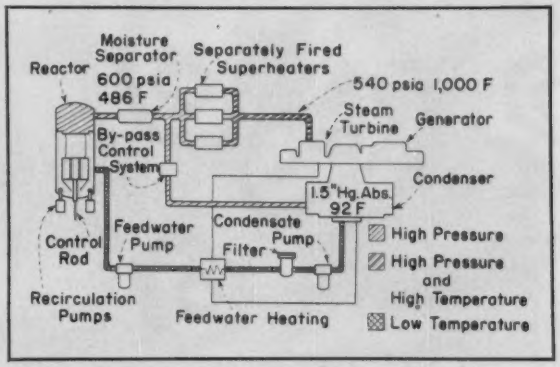
More Information Wanted

Plans now call for finding answers to such questions as:

1. How long can the fuel elements be irradiated before cladding failures or deformations dictate fuel replacement?
2. How radioactive will the steam plant equipment become after a long period of use?
3. How fast is the radiolytic decomposition of water in the reactor? How is this rate affected by various plant variables?
4. Will the special seals against leakage allow future conversion to expensive heavy water?
5. How is reactor control affected by changes in core configuration, fission product poisons, and degree of fuel burnup?
6. Will corrosion of the reactor or steam plant equipment be a problem?
7. How much can the power level be raised above its rated 20 Mw?
8. Is the power plant equipment reliable for long continuous service? Which items should be altered in future power plant designs?
9. How could the plant have been built cheaper without affecting operation adversely?



Using this plant layout . . .



. . . and this technical design . . .

Northern States' Reactor Is Distinguished by "Re-Circulation"

The distinguishing mark of the 60-Mw re-circulation boiling water reactor power plant planned by ten Midwest utilities (EW, Feb. 18, p 66) is that its circulation pumps will control power output, reports Northern States Power Co.

This re-circulation design also is said to yield more power per unit of space than a standard boiling water reactor.

Turbine Steam Is Re-Used

Reactor power will be adjusted in "big steps" with control rods. Fine adjustments will be made by changing the speed of re-circulation pumps. In operation, the water will carry along with it the steam produced by heat of the nuclear reaction. Steam bubbles will be separated by centrifugal devices. After passing through the turbine, the steam will be condensed and returned to the reactor for re-use.

Fair Economy Cited

Preliminary estimates indicate that kwhr costs will be less than those of some midwestern plants, but not as good as the best.

Reactor will be rated at 133 Mw. Fired with conventional fuel, superheaters will raise the steam to 540 psi and from 488F (from the reactor) to 1,000F for the turbine.

Although nine other companies will share in the construction and initial operation costs, NSP will own and operate the plant, which is to be built somewhere on Northern States' system. The site has not been chosen yet.

This announcement brings to 19 the number of nuclear plants now planned in the U. S. at an estimated cost of $675 million, NSP reports. Total capability of these plants will be nearly 1.5 million kw. Three are scheduled for operation this year, and the rest by 1962. More than 60 utility companies have united to build and operate ten of the 19 plants.

Pleasant Valley: Decision or Delay?

FPC may move ahead on PNP plan despite Seaton's request for a study of high federal dam at site

Indications are that Federal Power Commission will go right ahead and decide on Pacific Northwest Power Co's application for the Mountain Sheep-Pleasant Valley project despite outside distractions.

The possibility of delay arose last week when Secy of Interior Fred Seaton announced he has ordered a "full feasibility" study of high federal dam at the Pleasant Valley site. He said the project would require more detailed investigation, and to allow time he would intervene at FPC on PNP's application.

The Seaton proposal might supplant the PNP Pleasant Valley dam and would also flood out the Hells Canyon site where Idaho Power Co plans the third of three dams licensed by FPC (EW, Jan. 28, p 103).

Seaton wrote FPC Chairman Jerome Kuykendall that he would notify the commission of the recommendations of the Bureau of Reclamation when study was completed.

Seaton's letter is in the nature of a routine report and asks nothing of FPC. Chances are this is precisely the way FPC will treat it.

To Be Decided After April 1

FPC is proceeding on schedule with its handling of the PNP case. The company filed its brief on the 15th of this month. Hells Canyon Assn, which is opposing PNP's application, and the FPC staff will file their briefs by March 15. Final PNP rebuttal must be in by April 1 after which it will be up to the FPC examiner and full commission to make a decision.

In its brief, PNP hit out at the costly "delaying tactics" of the intervening Hells Canyon Assn. The brief said there was "uncontradicted evidence" that the project is "fully adaptable to a comprehensive plan of development and would provide as much power, flood control, navigation, and recreation benefits as any alternate plan of record in this reach of the Snake River."

But the Seaton report is having repercussions elsewhere. Sens R. L. Neuberger (D-Ore.) and Wayne Morse (D-Ore.), both leaders in the fight for a high federal Hells Canyon dam, regard the Seaton admission that there may be need for more comprehensive development of the Snake River in this region as grist for their Hells Canyon fight.

What FPC will do on Seaton letter, there is this factor to consider:

The biggest factor Seaton cites in favor of a high dam at Pleasant Valley is making up the flood control storage deficiency now existing under the PNP and Idaho Power dams. But this situation existed when FPC licensed Idaho Power's project. At that time FPC said this deficiency could be met on other rivers in the Snake basin.

Democrats Hit New Trinity Plan

Preference question touches off controversy on Pacific G&E's partnership offer to Reclamation

A partnership proposal for Trinity River dam in California between Bureau of Reclamation and Pacific Gas & Electric Co is arousing quick Democratic opposition in Congress.

Although the initial opposition has come from California legislators, the touchy preference question may help Democratic opponents to gather wide support and even pull some Republicans.

When Trinity, part of Central Valley project, was authorized in 1955, its sponsors agreed, in order to get the project voted, to give the Secretary of Interior 18 months to negotiate for partnership development subject to Congressional approval.

PG&E was the only organization to propose to participate with Reclamation in the project.

Under this proposal, which Seaton sent to Congress, PG&E would:

1. Build at a cost of about $55.5 million power facilities totaling 384,000 kw.

2. Buy from the government over a 50-year period the falling water required to operate the facilities at $4.6 million per year.

This arrangement, said Seaton, would yield a net revenue of $165 million over the 50 years. It would decrease the investment of an all-federal project from $225 million overall cost by $55.5 million.

He said the plan would also yield $135 million over the 50 years in local, state, and federal taxes. Furthermore, to gain the $165-million surplus under all-federal operation would require a 0.9 mill hike in Central Valley project rates.

But, under the partnership plan, the power all belongs to PG&E with no consideration for preference to public power groups. This is the cause of most of the opposition.

Sen Thomas H. Kuckel (R-Calif.) last week opposed the partnership proposal as an "emasculation of power preference." Rep Clair Engle (D-Calif.) claimed the arrangement would repudiate the long-standing Congressional policy on preference. Both believe for this reason alone Congress will oppose the plan.

Since Trinity already is authorized as a federal project no further action would be required by partnership opponents.

Under federal development Trinity would be interconnected with power facilities of Shasta, Keswick, Nimbus, and Folsom dams, and with the PG&E system. Power capacity would be reduced from PG&E's planned total of 384 Mw to 369 Mw.

NET INCOMES FOR 90 OPERATING ELECTRIC UTILITIES

(for Calendar years 1956 and 1955)

Company	1956	1955
Alabama Power*	15,388,955	14,026,971
Appalachian Electric Power*	15,680,171	14,890,385
Arkansas Power & Light*	6,335,372	5,160,625
Atlantic City Electric	4,777,408	4,396,127
Baltimore Gas & Electric	16,006,000	14,347,000
Bangor Hydro-Electric	1,260,060	961,764
Black Hills Power & Light	704,210-D	704,305
Blackstone Valley Gas & Electric	1,484,516	1,313,898
Brockton Edison	1,050,582-D	1,097,016
California Electric Power	3,577,675	3,108,243
California-Pacific Utilities	757,382	698,312
Carolina Power & Light	10,338,746	9,368,985
Central Hudson Gas & Electric	3,674,804	3,485,177
Central Illinois Electric & Gas	3,090,968	2,757,729
Central Illinois Light	4,886,541	4,202,307
Central Illinois Public Service	9,007,234	8,988,467
Central Louisiana Electric	2,462,033	2,061,149
Central Maine Power	6,488,376-D	6,798,141
Central Vermont Public Service	1,363,585	1,362,319
Colorado Central Power	456,089	381,964
Columbus & Southern Ohio Electric	6,780,318	6,646,141
Community Public Service	1,497,109	1,427,696
Connecticut Light & Power	10,606,287	9,239,595
Connecticut Power	2,309,359	2,000,323
Consolidated Edison of New York	53,397,699	52,320,256
Consumers Power	31,187,282	29,035,909
Dallas Power & Light*	8,016,110	7,197,856
Dayton Power & Light	10,959,000	9,747,000
Delaware Power & Light	5,237,758	4,320,297
Detroit Edison	29,376,407	26,297,190
Duquesne Light	18,585,162	17,879,908
Empire District Electric	1,814,063	1,687,044
Florida Power & Light	17,138,754	13,755,271
Georgia Power*	15,442,035	14,160,274
Gulf Power*	2,853,074	2,448,685
Gulf States Utilities	11,074,762	10,639,980
Hartford Electric Light	4,242,123-D	4,297,161
Houston Lighting & Power	17,543,827	15,083,616
Idaho Power	5,770,766	5,027,904
Illinois Power	14,145,330	12,509,804
Indiana & Michigan Electric*	9,465,236-D	10,034,171
Iowa-Illinois Gas & Electric	5,031,563	4,841,456**
Iowa Power & Light	4,745,525	4,220,840
Iowa Public Service	3,801,377	3,520,465
Iowa Southern Utilities	1,498,369	1,394,938
Kansas City Power & Light	9,241,508	8,154,605
Kansas Gas & Electric	5,860,534	4,756,802
Kansas Power & Light	6,888,210	5,588,507
Kentucky Power*	1,398,322	1,242,875
Kingsport Utilities*	321,452-D	362,397
Long Island Lighting	12,472,839	11,064,950
Louisville Gas & Electric	7,311,495	7,041,502
Maine Public Service	561,863	549,788
Minnesota Power & Light	4,150,858	4,112,951
Mississippi Power*	2,546,901	2,210,105
Mississippi Power & Light*	4,364,500	4,188,860
Missouri Public Service	1,874,652	1,654,630
Montana Power	9,226,788	8,715,283
New England Gas & Electric	3,566,751	3,364,433
N. Y. State Electric & Gas	11,585,940	10,631,041
Niagara Mohawk Power	28,397,000-D	29,374,000
Northern States Power	20,471,283	18,691,896
Ohio Edison	24,768,944	23,350,814
Oklahoma Gas & Electric	9,428,977	8,367,255
Ohio Power	17,886,799	16,934,103
Otter Tail Power	1,894,591	1,818,253
Pacific Gas & Electric	75,774,000	71,035,000
Pennsylvania Power & Light	23,465,984	21,291,574
Philadelphia Electric	35,473,099	33,219,035
Portland General Electric	5,129,079	5,021,980
Potomac Electric Power	9,521,300	8,457,400
Public Service Electric & Gas	32,035,326	30,333,686
Public Service of New Hampshire	4,430,871	4,199,892
Public Service of Oklahoma	7,811,636	6,615,471
Rochester Gas & Electric	6,473,235	5,810,743
Rockland Light & Power	2,197,800	2,054,061
St. Joseph Light & Power	1,002,029	944,980
Sierra Pacific Power	1,495,596	1,099,829
Southern California Edison	33,657,332	29,628,919
Southern Indiana Gas & Electric	2,312,300-D	2,455,036
Southwestern Public Service	8,009,367	6,742,767
Tampa Electric	4,024,517	3,410,990
Texas Electric Service	13,451,092	10,910,131
Texas Power & Light*	11,745,978	10,615,841
Toledo Edison	6,524,564-D	6,991,549
Tucson Gas Electric Light & Power	2,173,880	1,737,131
Utah Power & Light	7,525,812	6,887,182
Virginia Electric & Power	21,135,879	19,052,033
Washington Water Power	5,364,386	4,933,617
Wisconsin Power & Light	6,359,004	5,868,841
Total—90 companies	912,624,275	841,337,402

*—Indicates all common shares are owned by a holding company.
**—Adjusted.
D—Indicates decrease from 1955.

Earnings Sample Shows 8.5% Gain

- **First 90 utilities report net income of $913 million for '56, or $71 million more than for '55**
- **Pacific G&E had the highest gain; Kingsport Utilities had lowest**

The first 90 electric companies reporting their 1956 earnings showed a total net income of $912,624,275—an increase of $71,286,873, or 8.5% over 1955. This percentage increase was somewhat lower than the 11.2% increase over 1954 reported by 75 companies for 1955 (EW, March 12, 1956, p 48).

Eighty-one of the 90 companies, listed on the opposite page reported an aggregate net income in 1956 of $853,118,432, an increase of $73,894,806, or 9.5% over 1955.

Of the 90 companies Pacific Gas & Electric Co, San Francisco, had the highest net income, $75,774,000. In second place was Consolidated Edison Co of New York with $53,397,699. Lowest was Kingsport (Tenn.) Utilities, a 20,000-meter subsidiary of American Gas & Electric Co, with a $321,452 net.

Naturally the higher earnings of the 81 companies can be attributed to the 10% increase in kwhr sales. But important was the energy source of the companies. For most hydro systems 1956 was a fairly good water year. For fuel-burning systems consumption went up only 7%. This helped to offset rising costs of coal and oil. Maintenance was up 5%. But operating expenses, up 9%, were balanced by an identical increase in operating revenues.

By regions, the largest gain in net income was recorded in the West South Central area consisting of Arkansas, Louisiana, Oklahoma, and Texas. It amounted to $97,376,263 in 1956 ($84,822,237 in 1955). The Middle Atlantic region (New York, New Jersey, and Pennsylvania) came up with the smallest increase—4.8%. Net income for this region totaled $232,536,296 in 1956 *vs.* $221,860,558 in 1955.

The nine companies reporting declines will probably show increases this year. All of them reported "unusual conditions" not likely to be met in 1957.

Niagara Mohawk Power Corp reported a $977,000 drop in net. This was due to a "loss of a large source of power at the Schoellkopf Station," the company said. With this plant wrecked by a rock slide, about 8% of the company's capacity was idled. The company had to replace this loss with coal-burning capacity and by increasing its energy purchases from neighboring utilities. Pres Earle J. Machold said that this "substantially increased our cost of doing business."

Central Maine Power Co had a poor water year. It, too, turned to increased steam generation and power purchases which increased expenses $1.1 million.

Ten companies with increases in net income of over 20% are listed in a table above.

Leading the list was Sierra Pacific Power Co, Reno, Nev., which reported an unusual gain of 36%. Operating revenues of this company went up $767,279 in 1956 over 1955. The company was able to carry nearly $400,000 down to its net income.

Bangor (Maine) Hydro-Electric Co, in the opposite end of the United States, reported operating revenues of $6.8 million as compared with $5.9 million in 1955. About one-third of the increase was taken down to net.

Nine Companies Had Lower Net Incomes (1956 Versus 1955)

Company	Amount
Black Hills Power & Light	$ 95
Brockton Edison	46,434
Central Maine Power	309,765
Hartford Electric Light	55,038
Indiana-Michigan Electric	568,935
Kingsport Utilities	40,945
Niagara Mohawk Power	977,000
Southern Indiana Gas & Electric	142,736
Toledo Edison	466,985
Total	$2,607,933

Ten Showed Largest Increase in Net Income

Company	Percent Increase
Sierra Pacific Power	36.0
Bangor Hydro-Electric	31.0
Tucson Gas, Electric Light & Power	25.1
Florida Power and Light	24.6
Texas Electric Service	23.3
Kansas Power & Light	23.3
Kansas Gas & Electric	23.2
Illinois Power	22.9
Arkansas Power & Light	22.8
Delaware Power & Light	21.2

Regional Breakdown of Increase in Net Income

Region	Percent Increase
New England	6.2
Middle Atlantic	4.8
East North Central	6.6
West North Central	11.1
South Atlantic	12.6
East South Central	7.8
West South Central	14.8
Mountain	10.6
Pacific	8.9
Total U.S.	8.5

Programs to Sparkle . . .

. . . at three up-coming industry meetings: Utility-Tree Conference, Edison Electric Institute's Sales Conference, and Southeastern Electric Exchange

Lively programs will characterize three up-coming industry meetings: The second, Street Tree and Utility Conference, March 7-8 in Cleveland, Ohio; Edison Electric Institute's 23rd Annual Sales Conference, April 1-4 in Chicago, Ill.; and Southeastern Electric Exchange, April 1-3 in Boca Raton, Fla.

The tentative program for the tree-and-utility conference lists Harry T. Sealy, vice president, Cleveland Electric Illuminating Co, as speaking on "Trees and Utilities." Case histories of "progress since the first conference" will be presented for California, Cleveland, Connecticut, Detroit, and Philadelphia.

"Design Principles of Tree Use to Fit Space and Environment," is the subject to be discussed by Markley Stevenson of Philadelphia, representing the American Society of Landscape Architects.

"Street Tree Programs in Operation," will be discussed by John Michalko, commissioner of shade trees, Cleveland; Robert B. Henn, supt of parks, Euclid, Ohio; Leonard F. Anderson, secretary, shade tree commission, Essex County, N. J.

Prof H. O. Perkins of the University of Connecticut will summarize the conference and outline what seem to be the "next steps."

Sales Meet to Draw 1,000

EEI's sales conference is expected to attract more than 1,000 top-level sales executives. The first two days will be devoted to committee meetings and group meetings. General sessions begin on the third day and will consist of speeches by some of the industry's outstanding personalities, as well as those in allied fields, reports T. O. McQuiston, chairman of EEI's commercial division executive committee.

At the Wednesday awards luncheon, these will be presented: George A. Hughes awards, Laura McCall awards, George Westinghouse awards, More Power to America awards, Martin award, Lighting Education awards, Lighting Promotion awards, and Frank Watts awards.

After committee appointments have been made, Don S. Kennedy, president of EEI and Oklahoma Gas & Electric Co, will visualize the electric industry "As Others See Us." A. C. Monteith, vice-president, Westinghouse Electric Corp, will tell why "Now Is No Time for Complacency." And Dr Donald Russell, president, University of South Carolina, will describe "Socialism."

John Childs, vice president, Irving Trust Co, New York, will speak on "Problems of Financing Continued Utility Expansion," and the Hon Jerome K. Kuykendall, chairman, Federal Power Commission, will describe "Trends in Utility Regulation."

As another highlight, Edgar H. Dixon, president, Middle South Utilities, Inc, will moderate an Atomic Power Development panel discussion. Dr Walter H. Zinn, president, General Nuclear Engineering Corp, will cover technological aspects; J. F. Fairman, vice president, Consolidated Edison Co of New York, Inc, will cover economic aspects; and Maj Gen Kenneth D. Nichols, will talk about "A National Atomic Power Program."

The Exchange points out that this meeting comes at the height of the Florida season—suggests casual sports clothes for daytime wear, dinner jackets for evening functions, and 30¢, 50¢, and 75¢ tips for breakfast, lunch, and dinner, respectively.

Meter Readers Get Uniforms

These young meter readers are dressed in new, light-blue uniforms which Seattle (Wash.) Dept of Lighting hopes will support employee morale, serve as a recognition aid for customers, and make the men more "presentable."

Made of a wool material, the uniforms carry a gold City Light shoulder emblem and the meter reader's first name over the left breast pocket. Cold weather uniform includes a light jacket and matching "cruiser coat."

What is the effect of this uniform on dogs? Perhaps this is premature, but during the first three weeks the utility's 33 meter readers reported no bites. During this time, the men made about 92,000 readings.

Empire's Diesel Plant Burns; WWP Has 4,000-v Short

Explosion and fire recently destroyed the 1,000-kw diesel plant of Empire Electric Assn at Cortez, Colo. The operator was burned on an arm. Reportedly the head of a crankcase blew out, spreading flaming oil through the plant. About 4,500 customers were affected. Damage estimate: $300,000.

Earlier, Washington Water Power had an outage when a short circuit on a 4,000-v bus put eight circuit breakers out of commission and destroyed about 25 disconnects at its Long Lake station. The intense heat fused cement, insulator porcelain, and cable copper into a mass. 'Round-the-clock repairs restored one generator to service in two days.

A Generating "Capitol"

Somerset, Mass., (pop. 8,566) may become a sort of generating "capitol" for New England utilities in the next few years because of its excellent port and fuel storage facilities, condensing water supply, interconnection possibilities, and industrial location. Montaup Electric Co's new Somerset station soon will reach a capacity of 300 Mw, and the utility already has bought land nearby for another plant, to develop 600 Mw ultimately. Forty miles away in Boston, New England Power Co also announced purchase of 225 acres in Somerset for a plant that eventually may develop 1,000 Mw. So in the next few years, this small tidewater town may boast a generating capability of nearly 2,000 Mw.

Good Old Army Surplus

Potomac Edison Co has $60,000 to spend this year to replace old transmission and construction trucks. The company reports that it will replace 25% of the equipment by purchases from Army surplus dealers. Already the company has invested $36,000 into ten trucks for conversion to hole diggers, cargo trucks, hydraulic derricks, and pole-hauling tractors. The trucks cost about $3,500 each. New on the commercial market, they would cost nearly $13,000. The trucks were bought in Texas.

Up for the Taking—$100

Connecticut Light & Power says its worst vehicle accident problem is bad back-up practice. Of 78 accidents last year through November, 22 were caused by employees backing into parked vehicles, garages, fences, and houses. CL&P offers $100 to the employee having the best remedial suggestion.

A Question of Benefit

New York's 65-year-old Gov Averell Harriman has said he will approve a contract granting 239,000 kw of St. Lawrence project power to Reynolds Metals Co. This means that Reynolds now will go ahead with its proposed $88-million reduction plant near Massena, N. Y., and that General Motors will build a foundry at nearby Rooseveltown to take molten aluminum directly from Reynolds.

The Reynolds plant will employ about 1,000, and GM's foundry will employ "several hundred." Construction of both plants will mean work for 5,000 to 8,000, it has been estimated.

Gov Harriman's action clearly indicated his belief that such disposal of St. Lawrence power would mean more to the employment and business prosperity of New York State than the alternative: a few-dollars-a-year reduction in individual electric bills in the area.

The action was opposed by the Liberal Party, the International Ladies Garment Workers Union, and rural electric co-ops, all contending that rural and domestic power customers should have priority on state-produced power.

Gov Harriman said he was "holding up" the proposed contract for sale of St. Lawrence power to Niagara Mohawk Power Corp "for further consideration." If approved, NMP will get 115,000 kw.

Intriguing Rumor

Northern States Power Co says it "heard" that a Siamese power company, eager to give top service, posted the following notice in each room of a Bangkok hotel:

"Sir: For the case that your electric light should fail, we beg to send you enclosed a postcard, which please send us at once when you find your light out. The company will then send you another postcard."

The Teen-Age Set

Westinghouse Electric Corp has announced 40 teen-age winners of its 16th annual Science Talent Search. Statistics: All are high school seniors. Nine girls, 31 boys were chosen. Youngest is 14. All plan research careers. Five hope to be electrical or aeronautical engineers. For fathers, six have businessmen, five have physicians, three have engineers. For his required "project", one built a high-frequency induction furnace; one experimented with a method of producing from heat rays an invisible image which, by changing the color of suitable oil films, could be rendered visible through photography; one designed a small radio frequency heating unit; one built a Van de Graaff generator (and in his spare time, a robot).

Clarification . . .

General Electric Co reports that it is not going out of the water heater business after all, but definitely will reduce the number of its models from 175 to 12, in three tank sizes. These will include 40 gal quick-recovery in round and tabletop models, and 52 and 28 gal round models. Variations to meet unstandardized utility requirements bred the army of water heater models, the company said. "Simplifying the business is an absolute necessity if we are to continue it on a sensible basis," said a spokesman.

How Much Do Costs Influence Prices?

"We don't pretend to price at cost —but at value . . ."

G. L. PHILLIPPE

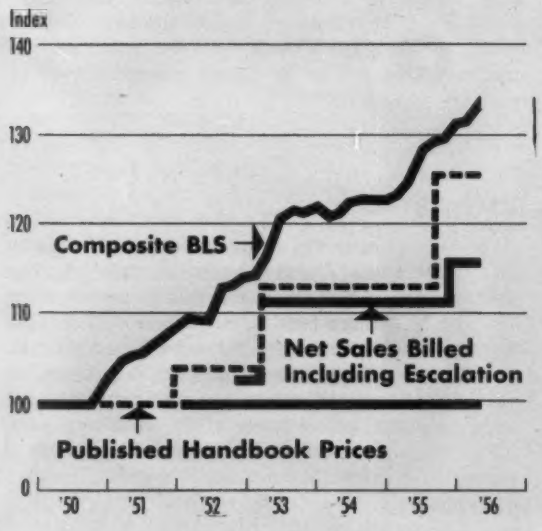
"The long run determinants of a sale will be value to the buyer and profit opportunity to the seller." From this base, General Electric Co Comptroller G. L. Phillippe explained pricing policies before the Public Utility Buyers Group.

"The customer's real concern," said Phillippe, "is value received and the resulting economic contribution to his end product or the satisfaction of his other needs. This gives frank recognition to the fact that the customer's appraisal of value, in the long run, is determining."

"Collaterally," Phillippe went on, "the manufacturer must also meet the competition of the market place. . . . (This) has no bearing on his cost, his profits, the equity of his position, or gratitude for past services. If he cannot meet the prices and values offered by his competitors and make a satisfactory profit, all other considerations are of little significance."

But, he added, "There is a tendency to accumulate a rather extensive succession of cost increases before increasing prices. Chart (below) illustrates what Phillippe termed this "significant lag."

"The significant lag . . ."



"Cost is only one element of price— an important one"

DAVID WILLIAMS

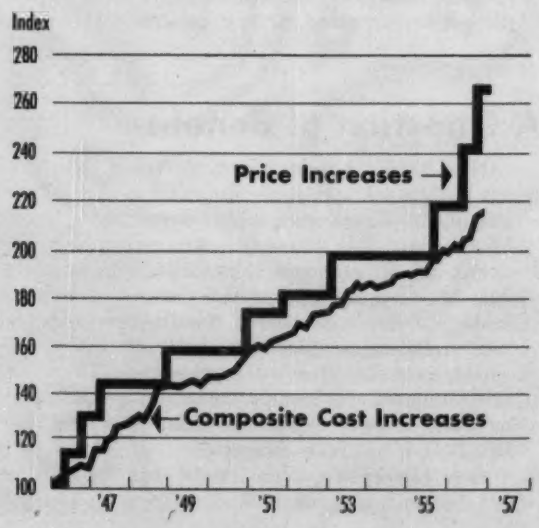
"It must be remembered that cost is only one element of price, although admittedly an important one," said David Williams, manager, Cable Bureau, Consolidated Edison Co, also speaking before the Utility Buyers Group.

"In demoralized buyer's markets, goods are often sold at below cost prices; on the other hand, in a buoyant seller's market, goods are frequently sold far above any reasonable costs as for example, the 55¢ price for copper in last year's premium market."

Pointing to price increases for turbine generators since January 1946 (chart below), Williams said, the (Bureau of Labor Statistics) composite cost index (weighted 55% labor and 35% materials) has risen to 216.4, and the price index to 266.4. Thus, the selling price has been increased 166.4% whereas total costs have increased only 116.4%. There have been three 10% price increases between Sept. 1955 and Sept. 1956. It is apparent, therefore, that turbine generator prices have outdistanced costs as represented by these indices.

"You have the vicious circle of price increases actually leading cost increases," concluded Williams.

"The vicious circle . . ."



Also At The Public Utility Buyers Meeting

Besides pricing discussions (see opposite page) purchasing agents attending the public utilities buyers group meeting in Louisville, Feb. 3-5, heard speakers cover a variety of subjects ranging from material availability to atomic power.

M. F. Beisber, director of market research and distribution for Line Material Industries of McGraw-Edison Co, outlined how "operations research" was used to develop an inventory policy which would provide a high level of customer service through adequate field stocks under sound economic conditions.

The study has resulted in an IBM system of inventory control at the company's headquarters which provides L-M with a complete, accurate picture of all finished goods inventory in the company's total branch operation. It enables the routing of customer orders to the nearest location of stock availability. Beisber said that in addition to improving L-M's stock turnover, it permits customers to reduce inventory investment, shortens lead-time in the order-cycle, and provides utilities with a greater total stock availability to meet storm or other emergency situations.

H. B. Kerr, Jr, purchasing engineer, Duquesne Light Co, spoke on the use of electronic tools in purchasing. He described how the "Programic Flexowriter", operating on punched card or tape information, has cut down on the routine repetitive functions of writing repeat requisitions (EW, July 2, 1956, p 47).

An insight into the outlook for metals was provided by three speakers: Myron H. Watkins, vice president, Youngstown Sheet & Tube Co, predicted that, despite increased steel production capacity, there will be a strong market for both plate and structural shapes for the remainder of 1957. However, sheets, bars, rods, and wire are expected to be in better supply than in 1956.

J. R. MacDonald, president, General Cable Corp, sees ample supplies of copper and aluminum during 1957 barring any unforeseen international crises. Abundant supplies and competition with aluminum will soon force copper prices down to around 30 to 32¢ a lb. He sees this as the floor because of government stock pile commitments to smaller producers.

And while copper will be available, it will meet stiff competition from aluminum, according to C. F. Manning, vice president, Reynolds Metals Co. He told of his company's development of aluminum uses in generators, distribution transformers, bus duct, meters, and transmission towers.

PA's were urged to look at some of the problems they face in the atomic age, by R. W. Hartwell, assistant general manager of Power Reactor Development Co. He said they must learn to live with impossible specifications and uncompromising time schedules when dealing with nuclear equipment.

Discuss Maintenance Problems

Inspection practices for outdoor air switches and circuit breakers told to PEA's Electrical Equipment Committee

Methods of solving maintenance problems for outdoor air switches and circuit breakers were discussed by Pennsylvania Electric Association's Electrical Equipment Committee Feb. 7-8 at Philadelphia, K. W. Kayler explained Duquesne Light Co's practices with outdoor air switches, and M. E. Willis told how Philadelphia Electric Co maintains circuit breakers.

Kayler emphasized the need for an outdoor air switch requiring minimum maintenance. Faced with a maintenance problem for years, Duquesne Light extended in 1949 the inspection cycle of all outdoor air switches from one to four years. This plan, which placed the switches on the same basis as substation transformers, provided that switches failing within four years would be rebuilt, revamped, or replaced.

This maintenance practice was based on the theory that it was a better long-range proposition to spend money on improving switches, thereby extending the inspection schedule, than to continue frequent inspections and trouble calls.

Before four years elapsed, however, a number of high-pressure small-area contact switches required attention. Although many of them had been purchased after 1938, their major trouble was severe pitting and subsequent burning of blade and jaw contacts. This condition was progressive and resulted in many contact replacements.

Began in 1955

Duquesne has been attacking this deterioration problem since 1955 by means of five different experimental contact-revamping programs. On some makes, the company installed new styles of contacts developed by the manufacturers on request. For other models, Duquesne made its own contacts.

It is too early to draw conclusions on this contact-revamping. But, the company plans to let the switches operate without maintenance until they show trouble signs. This endurance contest should give an index of the interval.

Kayler also pointed out the expense of field maintenance. Much work must be done on weekends at premium labor rates because of line, bus, or even complete station outages required to secure the clearances needed for inspection. Consequently, even a four-year inspection is not regarded as an ultimate. Duquesne would like to see a switch with an inspection basis of 12 or more years.

Willis emphasized Philadelphia Electric's use of instruments as maintenance tools to anticipate and correct incipient troubles of circuit breakers, rated 2.4 to 230 kv, indoor and outdoor types.

This program has been very successful in holding failures and callouts to a minimum. Willis claimed that by use of thoroughly trained leadermen and assistants the company has been able to keep equipment operating under peak performance conditions with minimum maintenance man-hours.

THIS TASK FORCE of employees is concluding research on Hartford Electric Light's past. Committee Chairman C. W. Mayott seated right, Evaline Stewart, left, and Malcolm Barton, second from left, are retirees who guide project

Oldtimers Spark History Project

DOUGLAS W. MINER, Public Relations Assistant, Hartford Electric Light Co, Hartford, Conn.

Should we have a written history of our company? If so, should we farm out the writing or do it ourselves? And if we do it ourselves, how should we go about it? In the past few years these and similar questions have been pondered by many electric utilities.

Among the veterans of three-quarters of a century of pioneering, competition, and expansion, Hartford Electric Light Co is in many respects typical. Chartered on April 12, 1881, the company began operating in 1883, six months after Edison opened his New York Pearl Street Station. Thus HELCO is now between two "diamond jubilee" years—1956 and 1958.

With those anniversaries in mind Austin D. Barney, then president and now chairman, directed shortly after World War II that work begin on gathering information. Directors and officers believed that a sound, readable history would foster good will by presenting the record of a well-managed utility and a responsible "citizen." In addition, they believed it would help dispel misconceptions about the character and practices of public utilities.

Distinguished "Firsts" Are a Starter

At first the task appeared simple. Over the years considerable lore had built up around a proud pioneering record. Items already on file included a cherished 1883 editorial which praised the company for "push and enterprise" shown in its initial operation, a spectacular display of 21 arc lamps at the Hartford railroad station. That the editor's choice of words had been prophetic seemed indicated by an impressive list of the company's pioneering "firsts." These include:

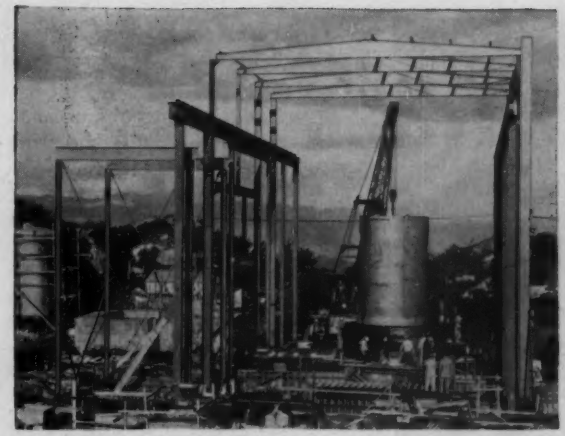
First hydro station in the East (1890); successful high-voltage transmission by a U. S. utility (1893); use of batteries to store off-peak hydro for peak lighting load (1896); aluminum transmission conductors (1899); large steam turbine (1901); U. S. promotional residential rates (1922); and the world's first commercial mercury-vapor boiler, believed also to be first U. S. topping job (1928).

But accomplishment lists are almost commonplace among today's older electric utilities, and scrapbooks can do little more than suggest outlines of a company's past. It became clear that a significant, useful history could not result in a reasonable period unless a task-force approach were adopted.

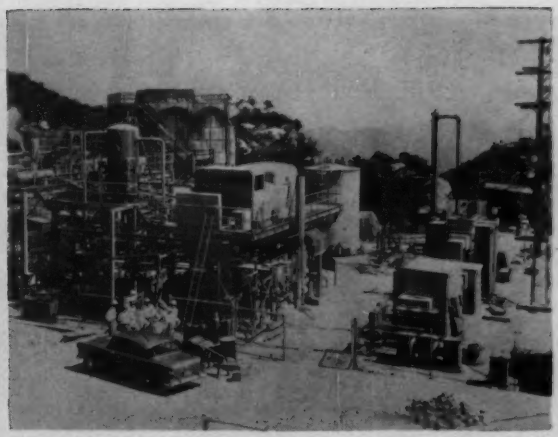
Accordingly, Pres Raymond A. Gibson early in 1956 created a part-time history committee to complete the job. Members were picked for prior familiarity with material about the company's past. Chairman is the company's natural resources consultant, Clarence W. Mayott, above, who was assistant to the president prior to his retirement a few years ago.

Mayott brought to the task his years of experience in converting technical information about the industry into useful, readable reports. Other members are a statistician

(*Continued on page* 123)



OUTER TANK is lowered into place at Atomic International's sodium reactor experiment. SRE can produce 20 Mw of heat



PACKAGED 7,500-KW UNIT will use heat from SRE. The air-cooled outdoor unit rests on 7,000-sq ft surface condenser

SRE Station Will Produce 7.5 Mw

GENERATION
Design

Technology of sodium graphite reactor will be explored. Plant will test once-through sodium-to-water heat exchanger

First non-military nuclear reactor in the United States to generate power for commercial use is scheduled to begin operation early this year. This sodium reactor experiment (SRE) is being built in the Santa Susana Mountains near Los Angeles by Atomics International, North American Aviation Inc, as part of AEC's power reactor development program. Primary purpose is exploration and improvement of technology associated with development of the sodium graphite reactor.

Southern California Edison Co is installing a 7,500-kw turbine-generator adjacent to SRE to utilize the reactor's designed 20 Mw of heat for power production. Edison's project, called Experimental Station, will explore the desirable characteristics of the sodium-cooled reactor, particularly throttle temperature and pressure conditions of steam close to those in conventional steam-electric stations.

Experimental Station is being built at a cost of $1.2 million to Edison. The company will pay 45¢ per million Btu for heat energy used for power production. Energy output is estimated at 50 million kwhr over the contract period.

With continuity of service an important and desirable factor in reactor experimentation, the steam-electric facilities are designed to provide reliability comparable to that of a major conventional steam plant. The turbogenerator is a conventional "packaged" 3,600-rpm unit. The turbine has a guaranteed heat rate of 11,544 Btu per kwhr at full load. The steam generator in conjunction with its attemperator will yield 620-psi steam superheated to 825F to the turbine.

As shown in the illustrated steam cycle, the by-pass through a pressure reducer and desuperheater around the turbine will stabilize steam conditions within the reactor before admitting steam to the turbine. The automatically controlled by-pass will route up to 5% of full-load steam directly to the condenser.

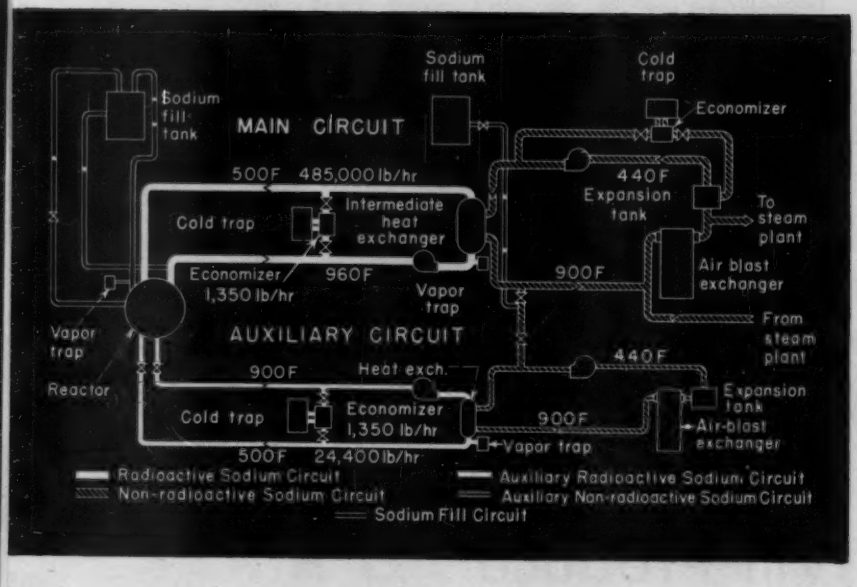
Of particular interest is the once-through steam generator, believed to be the first ever placed in commercial operation in this country. It combines the conventional economizer, evaporator, and superheater for operation under varying heat input temperatures. The unit is designed to supply constant-temperature steam over a 900- to-1,140F range of sodium inlet temperature and a 440- to-670F outlet temperature range.

To avoid thermal shocking of the steam generator, temperature changes will be limited to 30F per hr. During startup, the generator will be preheated to 350F with an auxiliary electric water heater. Sodium at 350F will be admitted, and the inlet sodium temperature will be increased gradually to 900F. Feedwater will be admitted to hold outlet sodium temperature to 440F.

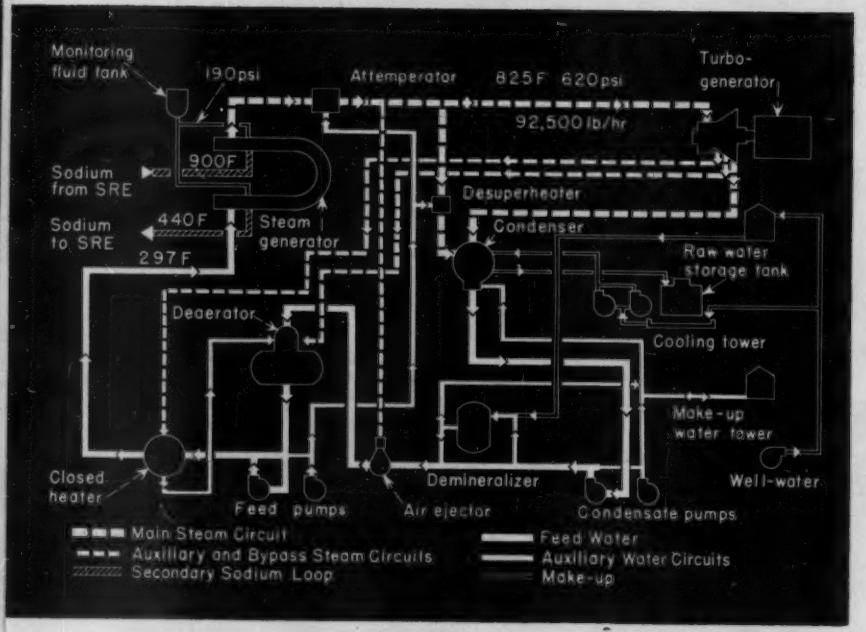
Control systems of the steam plant will cause the turbogenerator to follow reactor output. Heat will be removed from the secondary sodium loop to maintain a constant temperature of sodium returned to the intermediate heat exchanger. Turbogenerator output will be controlled during normal operation by a pressure device in the main steam header.

Experimental Station will be operated from the remotely located Edison control room.

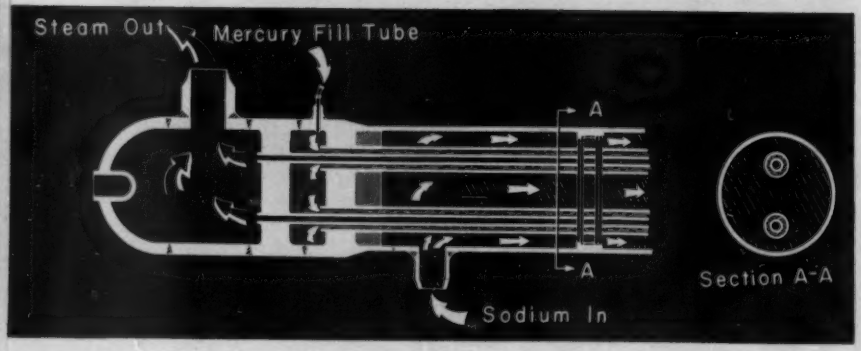
A pictorial description follows on the next two pages.....



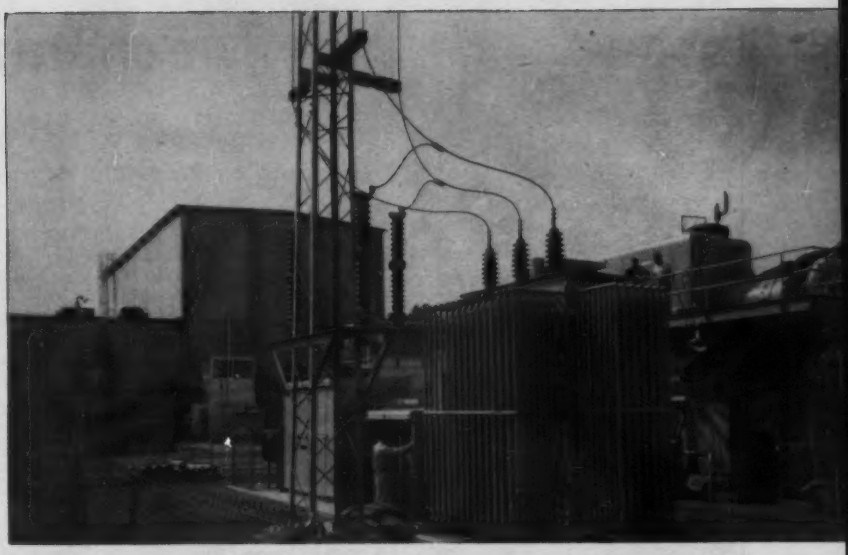
RADIOACTIVE SODIUM IS CIRCULATED through intermediate heat exchanger, where heat is transferred to non-radioactive sodium in the main secondary loop. Air blast heat exchangers in main secondary (non-radioactive) sodium loop will take heat from sodium in event of turbine shutdown. Auxiliary cooling system, similar to main secondary loop but with only 1-Mw heat capacity, will remove heat from reactor after shutdown. It is operated simultaneously with main loop to assure cooling in event of main loop failure. Variable speed pumps in both systems contain shaft sodium freeze seals. SRE will operate with slightly enriched uranium containing 2.8% atomic U-235.



FOR CONSTANT 825F STEAM AT THROTTLE, the attemperator will add feedwater to the steam via a Venturi section. For operation under a heat load of 100 million Btu/hr, the steam generator will provide 88,700 lb/hr of 620 psi, 825-F steam with no attemperation. At sodium temperatures above 900 F, about 11,000 lb/hr of steam will be provided by the attemperator and the rest by the steam generator.



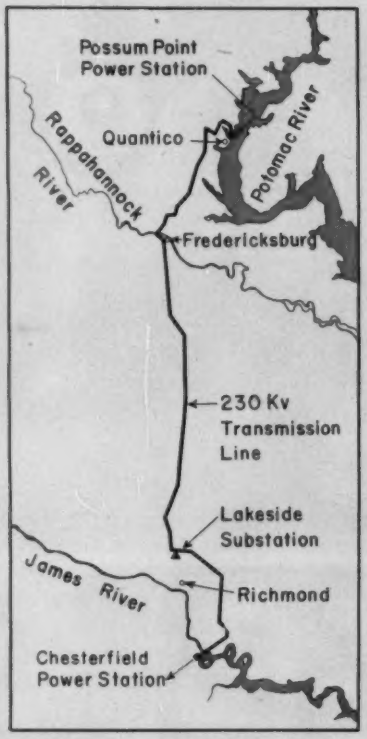
ONCE-THROUGH STEAM GENERATOR is an all-stainless-steel heat exchanger. Double-wall tubes have sodium on the shell side and water flashing to steam in the inner tubes. Annular region between tubes contains mercury at 190 psi as a pressure-monitoring fluid to detect tube failures



EXPERIMENTAL STATION being built near Los Angeles by Southern California Edison Co will use heat from a sodium graphite reactor (SRE) on an experimental basis. Experimental Station will be operated from the Edison control room which is remote from the SRE control room (shown below). Telephone and instrumentation circuits will tie the two together.

REACTOR CONTROL ROOM for the sodium graphite reactor (SRE) in the Santa Susana Mts near Los Angeles receives final check preparatory to operating the reactor in 1957. SRE is being built by Atomic International, a division of North American Aviation, Inc, as part of AEC's power reactor development program.

SPECIAL LIFTING fixture is used to install 75-ton loading face shield. Eighty-one holes through the shield provide access for removing and replacing fuel elements, and operating control and safety rods.



NEW LINE has a total length of 96.4 miles, from Potomac to James River

Mechanization Speeds

Dismantling, construction techniques help Vepco to meet schedule on 96.4-mile H-frame link between power plants

J. D. SHAW, Transmission Engineer, Virginia Electric & Power Co, Richmond, Va.

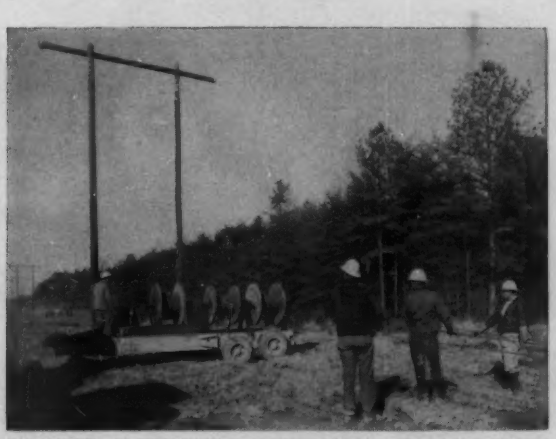
L. S. S. SMITH, Asst Gen Supt of Construction, Stone & Webster Engineering Corp, Boston, Mass.

Mechanized dismantling and erection techniques, along with careful planning, are speeding to completion on schedule the first 230-kv transmission line on the Virginia Electric & Power Co system. Only 6½ months were allowed for replacing 62.9 miles of old 110-kv construction with 96.4 miles of H-frame line.

The new line was needed to increase capacity between Chesterfield and Possum Point. These generating plants are linked by a modern 110-kv, H-frame line, built with 477-MCM ACSR and two overhead ground wires. This line, also 96.4 miles long, parallels for 75 miles an unshielded, 110-kv line 30 years old. For most of 75 miles, both lines are on a 200-ft right-of-way, spaced 75 ft apart.

Vepco could increase transmission capacity by either of two methods. It could rebuild the older line completely and construct a third 110-kv line. It could also replace the older line with one of

Adapted from a paper presented at the Southeastern Electric Exchange Engineering & Operation Section meeting in Richmond, Va.

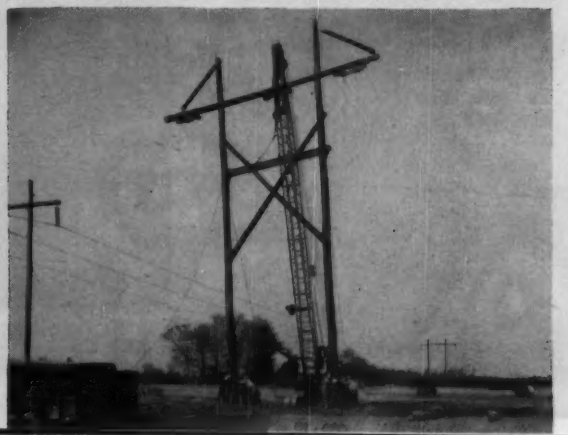


OLD WIRE of 110-kv line was reeled by engine-powered equipment, an important factor in expediting its replacement

OLD H-FRAMES were loosened from the ground by hydraulic jacks during their removal with a view to partial salvage

CRAWLER CRANE equipped with a 60-ft boom made rapid progress in lifting out the old H-frames of the 110-kv line

60-FT CRANE on tractor also set the new structures which previously had been assembled completely on ground

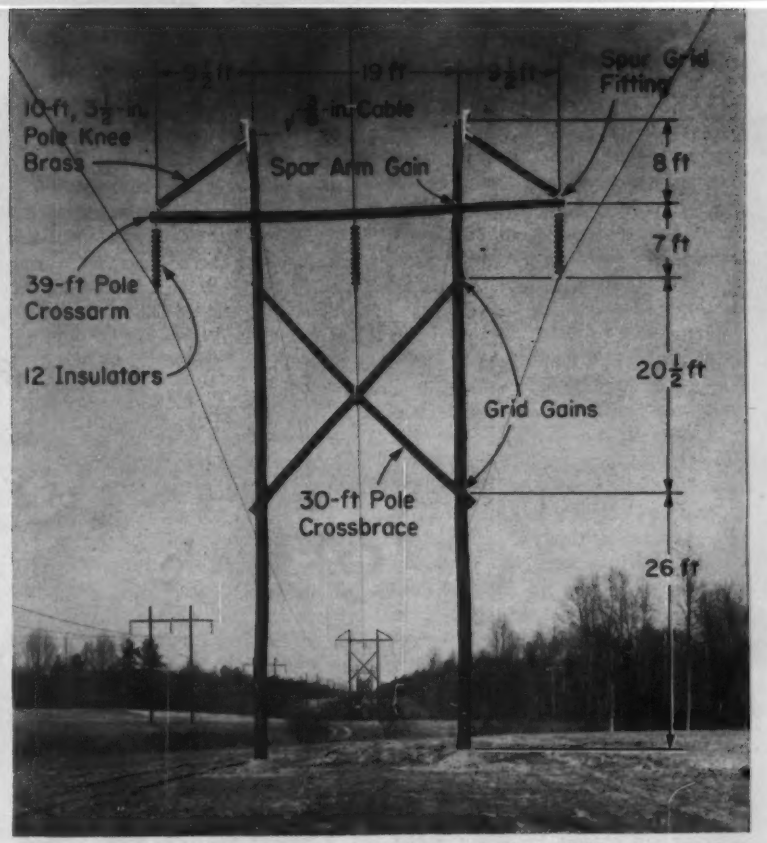


230-Kv Line

higher voltage. Comparison of the choices showed estimated line and substation costs, as well as line capability, favored the 230-kv line. Moreover, that voltage is used or is contemplated by neighboring utilities, so that a Vepco line at 230-kv would facilitate interconnection.

Stone & Webster Corp, designer and builder, selected a single-circuit, wood H-frame with spar arms as the most economical. A need for more circuits seemed improbable.

At top and bottom, the basic H-frame has been strengthened by X-braces. With these additions, the tangent structures withstand bending at the ground line under transverse wind loading. The poles are creosoted pine. Bracing was needed near the pole tops to withstand transverse loading, as well as for strengthening the crossarms against vertical conductor loads. Creosoted wood members were added between the ends of the crossarm and pole tops, and a guy-wire tie was run between the pole tops. Large angles were turned on conventional three-pole structures, the pole spacing being suitable for 230 kv.



230-KV H-FRAME LINE connects Possum Point and Chesterfield power stations and has tap to Lakeside substation: Only 6½ months were allowed for job

Tested to Destruction

To analyze pole movement in uplift and the subsequent transfer of stress, the company tested tangent structures to destruction. It also sought to locate points of maximum bending stress under transverse load. Two tangent structures of 70-ft, class 3 Southern yellow pine poles were loaded with vertical weight equivalent to ice. A truck-mounted winch simulated transverse wind loading. Both poles of one structure were set with 2 ft of concrete at the bottom of the holes. The second structure had uplift plates on one pole and pneumatically tamped earth backfill around the other. Transverse loading was alternately applied in both directions to place all poles in uplift.

Test results showed a safety factor of 4.8 for design loads. Deflection was within satisfactory limits, and vertical pole movement negligible even with the earth backfill. Tests on creosoted pine stubs showed that well-tamped, crushed stone was superior to anchor plates.

Crushed stone has been used at tangent structures where earth conditions are questionable and also on 1- to 5-deg angles. It is used also on structures where tangent spans exceed 700 ft. In all, it is used on about half the structures.

The 230-kv line was spaced 75 ft from the center of the newer 110-kv line and 75 ft from the edge of the right-of-way. Where only a 150-ft right-of-way was available and additional space could be obtained only at exorbitant cost, the existing 110-kv line was relocated to provide 62-ft spacing between centers of the lines. Where the spacing is less than 75 ft, the 110 and 230-kv structures are about opposite.

There are two short sections of towers. One is the James River crossing at Chesterfield. This is made up of four double-circuit towers of horizontal configuration. Phase spacing is 15 ft. Towers carry a 110 and 230-kv circuit.

Design Features of 230-Kv Line

Conductors: 795-MCM ACSR, 45/7 stranding
Poles: 70-ft creosoted pine, class 1, 2 & 3
Crossarms: 39-ft creosoted pole, class 4 min
Phase spacing: 19 ft
Minimum ground clearance: 29 ft
Insulators: 12 in suspension, 13 in strain
Hardware, Fastenings: Timber connections bolted with spur grid malleable fittings where required
Shielding: Two ⅜-in. high-strength Bethanized wires
Wire Tension: 8,700 lb in conductor, 5,250 lb in shield wires under NESC heavy loading

The other section of double-circuit towers is across a golf course where more right-of-way could not be obtained. Existing 110-kv towers are being replaced with five double-circuit towers having vertical configuration and 18 ft, 9 in. between conductors. The top and bottom crossarms are 33 ft, 3 in., and the center arm 41 ft, 3 in. These towers will carry the 110 and 230-kv circuits.

Because future 230-kv lines will probably be built out of the two power stations requiring 230-kv switchyards, terminal structures are temporary wood-pole construction. One 3-phase, 150-Mva, 230-110-kv autotransformer with tap changing under load will be installed at Possum Point and two 100-Mva, 3-phase autotransformers at Chesterfield. All switching is on the low side, and transformers connect to the 110-kv buses.

At Lakeside substation, a 60/80/100-Mva autotransformer with tap changing under load and a steel switching structure will be installed with an oil circuit breaker on the low side. On the high side will be 230-kv air break switches with provision for future oil circuit breakers.

Of the 230-kv line's 96.4 miles, 33.5 are being built on new right-of-way. The remaining 62.9 miles are being built on the existing right-of-way after the old 110-kv H-frames have been salvaged.

The old line had to be replaced in 6½ months of outage time, scheduled in three periods over 13 months. Thus work had to start on the first day of the outage, and material had to be bought so framing could begin a month before.

"Brush Hog" Cut Costs

Survey work was expedited by advanced mechanized clearing of a strip of right-of-way by a contractor, at an additional cost of $5 per acre. Before clearing the entire right-of-way, the contractor drove a "brush hog" ahead of the survey crew down the center of the new transmission line. As much of the new line has the same center as the existing one, the operator guided his machine by passing between poles of the H-frames. In one day this equipment brushed out 7 to 8 miles of line that would have taken axemen at least a week.

A month before framing started, a gang began constructing bridges across creeks, laying logs and slabs in swampy areas, and installing Missouri gates in fences, along 37 miles between Richmond and Fredericksburg. This cut erection time.

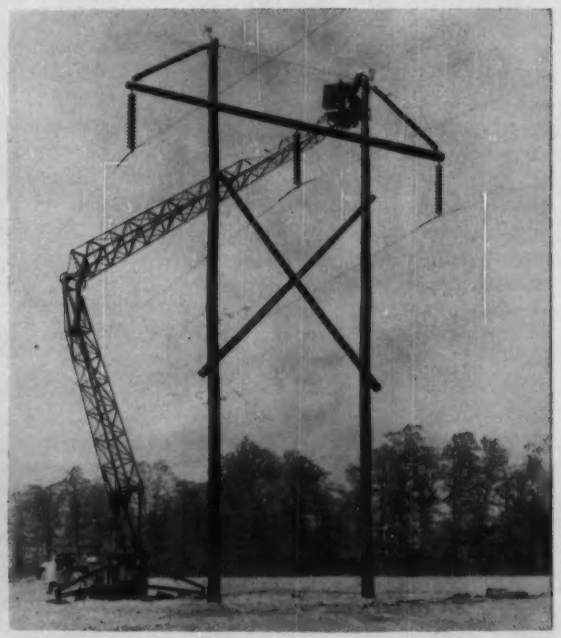
Removal of the old 110-kv line began on schedule. As most material was to be salvaged, structures were dismantled carefully.

To remove conductor, a reel stand was built and mounted on a low-bed trailer. The reel shaft was powered by an engine through four-speed transmission, a truck differential, and chain belts. One circuit mile of three wires can be reeled with this equipment in 30 min. Wire to be sold for scrap was coiled on a collapsible reel on the extension of a truck winch.

Old H-frames were removed by a D7 tractor with a 35-ft boom and two portable hydraulic pole jacks. The jacks, powered from the hydraulic system of the tractor, start the poles out of the ground. The entire structure is then lifted and laid carefully. After structures were taken apart, poles and crossarms were thoroughly inspected, rotted sections cut out, and usable sections measured and marked. These sections were hauled to a creosote plant for retreatment.

Poles and crossarms were found to be in excellent condition. About 90% of the poles and 77% of the sawed arms were reused for transmission and distribution construc-

ALL BACKFILL was tamped pneumatically, air being supplied from a 105-cu-ft compressor on a four-wheel drive truck



CONDUCTOR was clipped in, other overhead work done with a 78-ft mobile aerial tower mounted on a tandem axle truck

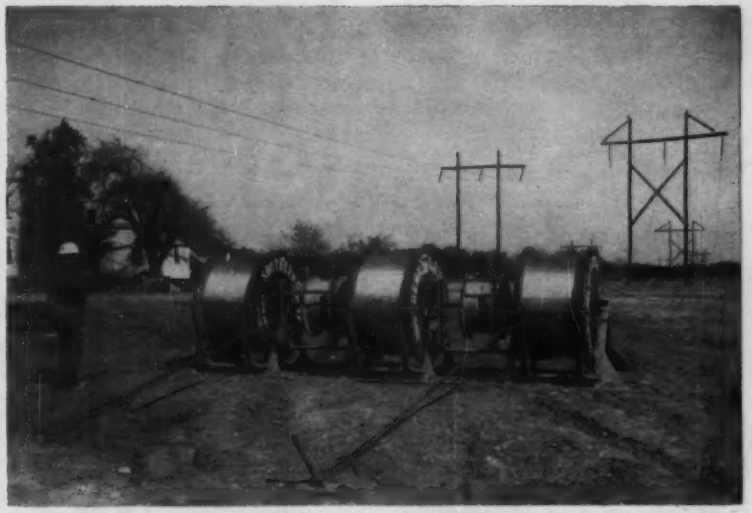
tion. Partial lengths of another 11% of the arms are being utilized.

New structures were assembled on the ground. This work was speeded by a D4 tractor with a small A-frame hoist, operating from the tractor winch. Poles, crossarms, and braces were hauled to locations by a D6 tractor. Pole holes were dug by a digger on a HD9 tractor. The 30-in. holes were dug just before erection of the structures, thus cave-ins were minimized.

A crawler crane with a 60-ft boom erected the structures. It had wide tracks and could travel most of the right-of-way. For lifting a structure, weighing 7 to 8 tons, a bridle sling was attached to a spreader made of two 12-in. channels, back-to-back. Slings from the spreader were attached to the poles with sliding choker hooks. After the structure was set, slings were removed from the poles by a hand line rigged to the back of the hook. Climbing was eliminated.

Water was pumped out of holes with a 3-in. diaphragm pump on the side of the crawler crane. Its 40-ft section of suction hose was suspended from the boom in transit.

CONDUCTOR was spliced expeditiously by means of a jointing compressor mounted on a small two-wheel trailer and equipped with gasoline-driven pump



STRINGING of conductor and static wires was done from two reel stands built to hold five reels. Reels were braked by shoes pressing against edge of the reels

Tamping Done Pneumatically

All backfill was tamped pneumatically. Air was supplied from a 105-cu-ft compressor on a 4-wheel drive truck. Connections for air hoses were on both sides of the truck. Metal doors with locks have been installed at the side and rear of the truck, so that tamps, hose, and shovels can be stored in the truck when it is left on the right-of-way over night. Crushed rock is hauled along the right-of-way in boxes on skids.

Using these methods, the contractor erected 14 structures in an 8-hr day—not quite 2 miles. In a 51-mile section over hills, swamps, and small rivers, an average of eight structures a day were erected and backfilled. Mobile radios greatly assisted communications among supervisors, foremen, and engineers. Ten vehicles have radios, supplemented by ten pack sets for inaccessible places.

For stringing conductor and static wires, two reel stands were built to hold five reels. The reels were braked by shoes pressing against the edge of the reels. Enough pressure was applied to keep short spans of conductor off the ground. Supports were placed in the middle of unusually long spans to prevent damage to the conductor from dragging. Stringing required one man with a radio. All five wires were pulled at one time by a D6 tractor.

For setting guard pole structures at wire and road crossings, a truck was equipped with a hydraulic derrick and pole-hole digger.

For splicing the static wire and conductor, a jointing compressor was mounted on a small two-wheel trailer and equipped with a gasoline-driven hydraulic pump. This pump cut splicing time to a third of that required to pump by hand.

Clipping in of wires, as well as other overhead work, was done from a 78-ft mobile aerial tower on a tandem-axle truck. The tower boom was controlled from either the basket or the ground. Five men using the tower can clip in a mile of line a day at a third of the labor cost of clipping in by climbing poles and working from ladders.

Utility Substations Can Be Good

SUBSTATIONS
Design

Wisconsin Electric Power's program wins public approval of substations in business, residential, and rural areas

R. I. POWERS, Chief Station Design Engineer, Wisconsin Electric Power Co, Milwaukee, Wisc.

Wisconsin Electric Power Co is taking special measures to design substations that are good neighbors. The company is giving extra attention to the design of substations that will meet the exacting standards of reliable operation and still win public approval.

It isn't easy to give substations good neighbor characteristics. The company had to solve several problems and make a number of changes. Housekeeping practices had to be improved, also, if the company's subs were to be approved by zoning and planning boards, building inspectors, common councils, and prospective neighbors.

Business Area Sub Makes Hit

Shortly after these conclusions were reached, Concordia substation was designed for a local business area. Indoor cubicle-type switchgear was used for switching feeders, and three 10,000-kva transformers were mounted on piers in cells immediately behind the building. The architectural treatment and landscaping made the sub an outstanding contribution to the neighborhood.

The next project was Westown substation adjacent to apartment buildings and dormitories, where both noise and service reliability were important. Again the building was designed to harmonize with other neighborhood structures.

As at the Concordia sub, indoor cubicle-type switchgear was used. However, closed cells were built at the rear of the building to house three 10,000-kva transformers. The architectural treatment at Westown was so well accepted that people frequently asked what use was made of the building.

Burleigh substation was constructed in a newly developed area as the third project of the good neighbor program. It is an outdoor cubicle-type with decorated wall.

While its general appearance is pleasing, Burleigh's design is less satisfactory than that of Concordia and Westown because: (1) It does not solve noise problems, (2) it does not completely conceal the equipment, (3) it does not provide shelter for operation and maintenance during inclement weather, and (4) snow removal is a problem.

A formal building could not be justified for suburban areas and those rural areas with high load density or rapid load growth. So the company designed an outdoor cubicle-type landscaped sub.

Generally, a completed substation of this type consists of three 10,000-kva transformers in switchgear units and an auxiliary house. Two units make up the initial installation. Secondary buses can be interconnected but are usually operated split to reduce short-circuit duty and improve flexibility of voltage regulation. Supplementary regulators are used where required for unusually long feeders.

Both incoming lines and outgoing feeders are underground. An oil-insulated three-position selector switch on the high-tension side of each transformer makes it possible to supply the transformer from either of two lines. On smaller units, where local transformer protection was required, fuses were installed either in air or under oil in the transformer.

Lightning Protection Simplified

Studies showed that lightning arresters could be omitted at the transformer when station-type arresters were installed at the supply end of each cable. This arrangement has been used for several unit-type subs.

In the latest design of this type the supply lines were terminated in potheads adjacent to the transformer, and lightning arresters were installed at the transformer. While this arrangement does not eliminate exposed high-tension equipment in the sub—as was the case in the previous design—it does make it possible to apply lightning arresters at the transformer and to isolate, test, and ground the lines. Operating experience will determine which design is preferable, as both have good and bad points.

In earlier designs metallic conduits were laid in the concrete slabs for control wires—a costly and inflexible operation. But in the latest designs a wiring trough on top of the cubicles has facilitated installation of control wires between any two pieces of equipment either during original construction or at a later date. It now appears that a raceway can be built into the cubicles at the factory to accomplish the same result.

A 125-v control battery, auxiliary power cabinets, test facilities for the air circuit breakers, and a multiple pen recorder were placed in the control house to record feeder operation.

Site Planned by Architect

Generally, when a new substation project is undertaken, a physical layout is made of all equipment. The company architect then determines placement on the site and prepares a landscaping plan. Grading, fencing, conduit installation, and slab construction are completed before the equipment arrives.

In more recent installations the stoning around the equipment inside the fence has been kept to a minimum. A lawn between the stoned area and fence improves the appearance. Vines, shrubs, and trees are planted and will in time provide the desired concealment.

Less spectacular but very important are the rural subs. They are supplied from overhead lines terminating on steel structures. Automatic air break switches provide multiple line choice. Tap-changing equipment on the transformer regulates the secondary bus, and the feeders are protected by oil circuit reclosers.

In rural areas, landscaping is

Neighbors

limited to grass and trees for minimum maintenance. Clean station appearance and simple landscaping usually suffice.

Use of color to improve substation appearance presents intriguing possibilities. Color photographs of the surrounding area are analyzed, and a harmonizing color combination is selected. The several sub components are then painted with different colors to break up an otherwise uniform color mass into smaller contrasting areas.

Color treatment has not yet been used but is receiving serious consideration. Factors such as fading, soiling, and oil marking must be evaluated before the company can recommend extended use of color, particularly in this climate.

Noise Requires Attention

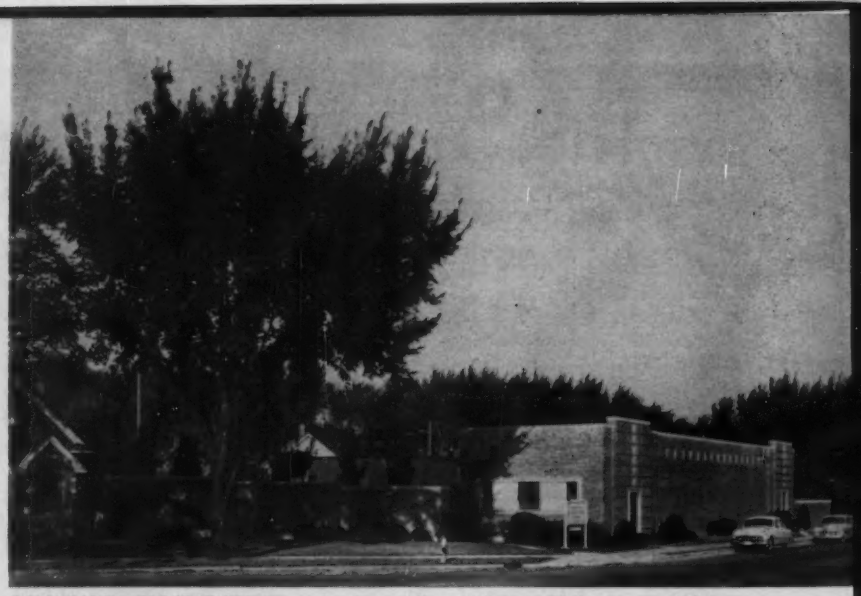
Noise is another design aspect requiring attention. The author suspects that most noise complaints are not caused by noise but by the neighbors' resentment to the sub.

Transformers have been purchased with one step of noise reduction to guard against possible complaints. This increases cost and does not produce anything a complainant can see. Although space has been provided for baffles, they are not considered desirable. Baffles are unsightly and expensive, impair ventilation, and obstruct maintenance and repairs. As a last resort, however, baffles can be used to assuage a serious complaint.

Noise measurements are made on all new transformers and around transformer sites. As a rule, it has been possible to stay within generally accepted noise limits.

Complete Enclosure Quiets Site

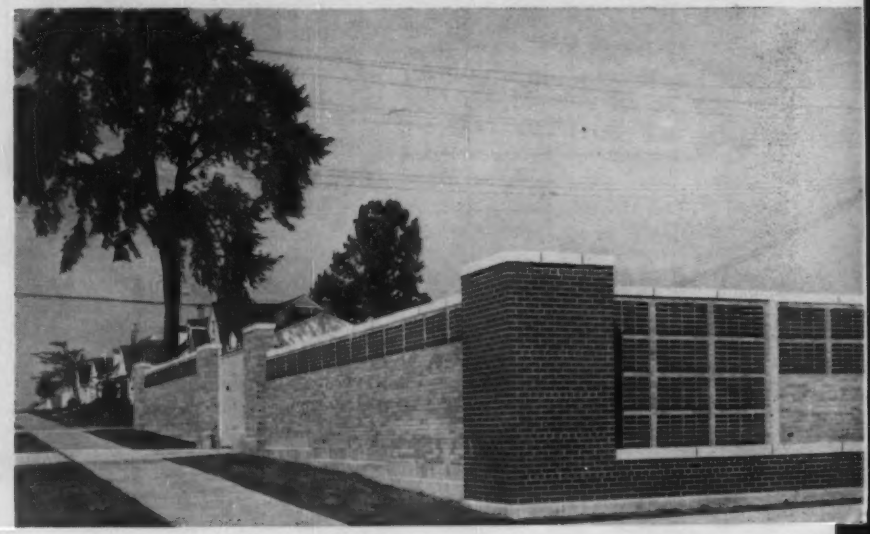
The only satisfactory solution to the transformer noise problem is a complete enclosure, such as the one at Westown. But manufacturers are striving to turn out quieter transformers. Improvements in core materials and bracing, together with better understanding of tanks and accessories, undoubtedly will produce quieter units. Substituting a gas, such as sulfur hexachloride, for liquid insulating mediums and coolants also offers promise.



CONCORDIA SUBSTATION in a business district has cubicle-type switchgear housed indoors and transformers mounted on piers in cells behind the building

WESTOWN SUBSTATION has indoor cubicle-type switchgear and closed cells at rear of building to house transformers. Its architecture was well accepted

BURLEIGH SUBSTATION'S wall gives pleasing appearance but does not overcome the noise and other problems of outdoor transformers and cubicle switchgear



Tries Transfer-Trip Carrier Relay for

BPA tests prove scheme for relaying through line faults on 287-kv circuit is simple, gives reliable protection

A. W. ADAMS, Relay Planning Engineer, Bonneville Power Administration, Portland, Ore.

Transfer-trip carrier relaying through line faults on one 287-kv circuit of the Bonneville Power Administration system has proved to be a simple, reliable method of line protection. Field tests and operating experience point to satisfactory performance. Additional installations at 287 and 345 kv are under consideration.

First installation of the narrow-band, frequency-shift type of carrier was on BPA's Grand Coulee-Olympia nominally 287-kv line. This line has autotransformers at each end, with switching at 230 kv. The single-phase autotransformers have a bank rating of 240,000/319,500/400,000 kva with a 13.2-kv delta tertiary, rated at 22,000 kva self-cooled, primarily for harmonic suppression. Primary voltage is 295 kv with a tap at 307 kv; and secondary voltage is 230 kv with a tap at 241.5 kv. The transmission line is 230.45 miles of 1,272-MCM ACSR Pheasant conductor. In accordance with standard BPA construction, overhead ground wires are installed for about 1 mile at each end.

With the circuit breakers on the low side, it was necessary to protect the transformers against internal faults. Narrow-band, frequency-shift carrier was installed for this purpose. Based on reports from other countries and other information, it was decided to operate the carrier from line relays as well as from transformer differential relays to obtain higher-speed line protection.

The carrier was changed accordingly from the original double-channel to a single-channel system with one transmitter and one receiver at each terminal. This improved the operating margin and reduced the number of channels required. Carrier was installed on B phase-to-ground on the 287-kv terminal with a line trap between the coupling capacitor and the transformer bank. The same carrier equipment is used for both line and transformer protection. Line relays send a signal of 4 to 6 cycle duration. Transformer differential relays send a continuous signal. This permits automatic reclosing for line faults.

A simplified schematic diagram of the carrier current transfer trip is shown in Fig 1. In this diagram rectifier A is rated to carry the trip coil current. It prevents the transfer trip from operating due to the control switch trip. Rectifier B, rated lower than A, keys the transfer trip as soon as the relay operates. Relay XR controls the duration of the tripping signal.

Staged tests were scheduled to determine the adequacy of this type of relaying. Carrier equipment from three manufacturers was installed temporarily for the tests. The first objective of the tests was to check operation during a fault within the transformer differential zone. The only carrier equipment used was single-channel equipment purchased for the installation. A single phase-to-ground arcing fault was initiated on the 230-kv side of the transformer within the differential protection zone. Performance of the relays and carrier was satisfactory.

Outputs from 1 to 2 W

A second transmitter and receiver were installed temporarily at each terminal so that carrier equipment from the three manufacturers could be tested through an actual fault on the line. This additional equipment somewhat reduced the operating margin of the equipment. Transmitter outputs were in the 1 to 2-w range. One transmitter at Grand Coulee, operated from the 258-v battery, had a slightly higher output. Carrier frequencies were about 92 kc from Olympia to Grand Coulee and about 170 kc from Grand Coulee to Olympia with double-frequency line traps and line-tuning units at each terminal.

Arcing faults were applied on B phase-to-ground at tower 34 which is 4,542 ft from Olympia substation bus. Two faults were initiated there. Results from one of these faults are compared in Figs 2 and 3. Transfer-trip time varied from slightly under 1 to about 2.5 cycles. These times were measured from closing of the auxiliary relay contact which initiated the carrier signal to closing of the carrier receiver relay. Faults were cleared at both ends in 5 to 6 cycles. These tests were made to establish that the carrier signal could be transmitted reliably through the fault.

A special receiver at the Olympia terminal showed a noise level 10 to 15 db above normal during the first arc initiation and during breaker interruption periods. Noise level at other times was actually

Based on a paper presented at AIEE's 1957 Winter General Meeting, New York, N. Y.

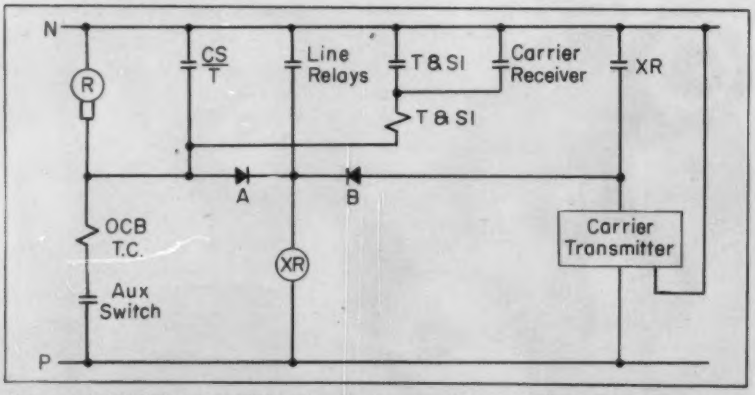


FIG 1—SIMPLIFIED TRANSFER-TRIP circuit uses silicon rectifiers A and B to control the time of trip. Relay XR controls duration of the tripping signal

287-Kv Line

below normal. Following the staged tests, the line was de-energized and solid grounds were applied on B phase at towers 4,540 ft, 5,650 ft, and 7,000 ft from Olympia substation. The operating margin of the carrier equipment was measured with grounds there.

About 10 to 15 db more operating margin was found at the two latter points than at the staged fault location. These tests, interpreted according to published information, seemed to establish the reliability of this type of carrier relaying for practically all faults expectable on this line. Following the initial installation on the Grand Coulee-Olympia line, carrier transfer-trip relaying has been installed on four more transmission lines. These include a 175-mile, 345-kv line with autotransformers, and a 230-kv interconnection with Idaho Power Co. They are also for transformer protection. Single-channel carrier is used for all installations except the interconnection with Idaho Power which uses a double-channel carrier.

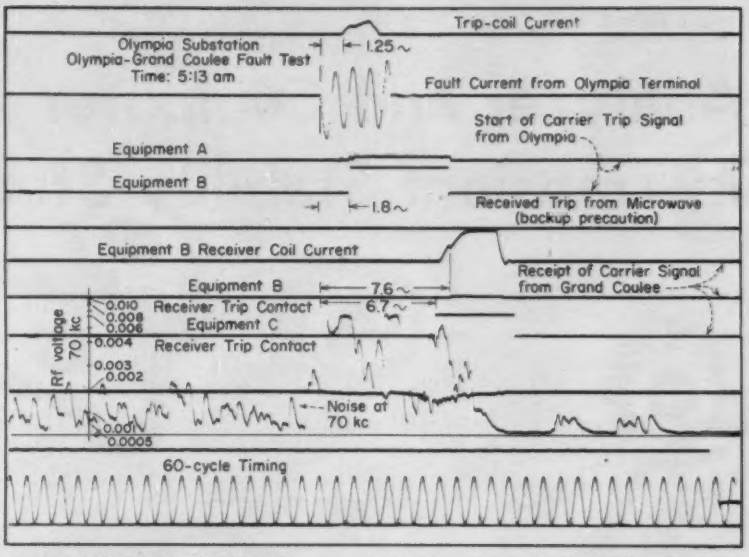


FIG 2—STAGED FAULT RESULTS compare operation through a fault of various carrier equipment. Phase-to-ground fault was introduced at tower from 287-kv bus.

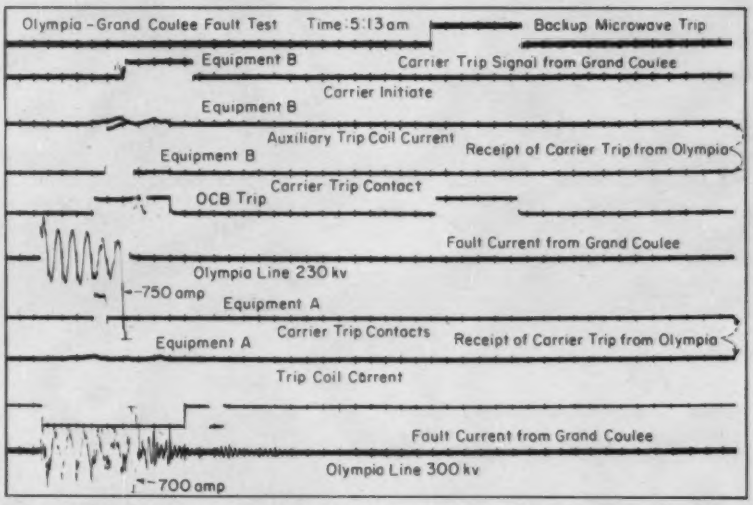


FIG 3—TRIP SIGNAL is transferred from Olympia to Grand Coulee substation. Tests were staged to determine reliability of transmitting signal through fault

Relayed Six Times

Operating experience with carrier relaying on the Grand Coulee-Olympia line has been satisfactory. During the 1955 lightning season, the line relayed properly four times. On one of these faults the Olympia terminal relayed by transfer trip from Grand Coulee. The other three faults were cleared at high speed by the line relays at both terminals.

The line has relayed properly six times in 1956 due to lightning. These outages were cleared at high speed by the line relays at both terminals. An oscillograph element at Olympia terminal for monitoring transfer trip indicated proper operation on each occasion. There have been no transformer differential and no improper operations of the transfer-trip carrier during normal system operations.

Although results to date are not conclusive, they confirm the tests and experience of others, and the simplicity and speed of transfer-trip carrier relaying are desirable.

It is essential that the receiver must not operate improperly due to any amount of noise while the guard signal is present. This noise level, of course, includes any noise resulting from disconnect switching. There have been no false operations on the Bonneville system from any cause, indicating that carrier equipment available commerically meets this operating requirement.

Protection is required to minimize false operation from noise upon failure of the transmitter or because of severe attenuation of the guard signal by sleet. Additional tests and information are needed to determine the best method of protecting against loss of signal. Although it appears that enough protection can be provided to prevent false operation entirely, present methods of protection either reduce the operating margin or increase the time delay.

A relay which operates after a time delay of 1 to 2 sec can be used to open the trip circuit and sound an alarm when the carrier signal fails. Experience on the Bonneville system indicates that time delay can be minimized in the receiver in this way. Overall operating times of 1 cycle or less are possible with equipment available commercially.

Analyzer and Computer Teamed In Transient Stability Studies

FRANK J. SHERMAN, Electrical System Planning and Development Section, Boston Edison Co, Boston, Mass.

An electronic digital calculator speeds the step-by-step computation of swing curves in ac network analyzer studies for Boston Edison Co. The combined devices enable three men—an analyzer operator, a data recorder, and IBM operator—to solve 8-machine stability problems at a rate of 3 to 4 points on the curve per hour. Manhour savings over hand computation are considerable, as it formerly required five or six men to maintain the same rate of solution with a network analyzer alone. Accuracy is improved by reduction in human errors and the feasibility of using more steps at closer intervals for the swing curves.

Equations derived according to S. B. Crary in "Power System Stability, Vol. II," published by John Wiley & Sons, Inc, are programmed as follows:

$$T_{a(n-1)} = T_{m(n-1)} - T_{e(n-1)}$$

$$\Delta\delta_{(n-1/2)} = \Delta\delta_{(n-3/2)} + KT_{a(n-1)}$$

$$\delta_n = \delta_{(n-1)} + \Delta\delta_{(n-1/2)}$$

where

T_m = mechanical torque of generator.
T_e = electrical torque of generator.
T_a = accelerating torque of generator.
δ = angle of generator rotor.
$\Delta\delta$ = change of angle of generator rotor.
K = machine acceleration constant

Subscripts indicate time interval.

To make the program perfectly general, each machine has a separate card with the following fields:

1. Time interval (n)
2. Machine identification
3. K
4. T_m
5. $\Delta\delta_{(n-3/2)}$
6. $\delta_{(n-1)}$
7. T_e
8. $\Delta\delta_{(n-1/2)}$
9. δ_n

Fields 2-4 are constant throughout the study and are punched at the beginning of the run. Fields 5 and 6 are taken from calculations of the previous point. Field 7 is read from the analyzer. Fields 8 and 9 are the results of the machine's calculation. At points of discontinuity in the electrical network, such as the first point, or the point where a switch is opened or closed, the T_e entered in the calculation is not the T_e read from the analyzer. Instead, what is actually recorded is the average of readings before and after the discontinuity.

In a typical run, the analyzer is adjusted to the desired angular displacements and the power output (T_e) is read for each generator. This information is transmitted to the IBM operator who enters it in field 7 of the appropriate card. The cards are then run through the 607 which punches the results of its calculations in fields 8 and 9. Field 2, 8, and 9 are interpreted and the information transmitted to the analyzer operator who proceeds to the next point.

While the analyzer is being adjusted, a new set of cards is being punched. Field 1 is increased by one. Fields 2, 3 and 4 are reproduced without change. Fields 5 and 6 are punched with the derived values of 8 and 9 respectively. The new cards are now ready to receive a new T_e. While the calculations are taking place, the data recorder plots the curves of machine angle vs time.

Much interest has been shown recently in the use of digital computers to solve engineering problems. However, much of this discussion has been concerned with the use of more powerful machines than the one used here. The benefit that can be derived by putting more readily available small machines to maximum use should not be overlooked. The calculation of swing curves is an operation exemplifying such use.

This bottom leads a sheltered life

A capacitor bottom needs protection these days. The now-standard 50-kvar unit is too heavy for any man to lift safely. We found this out when we introduced 50-kvar capacitors in 1955. They got dragged and pushed and the bottoms took a beating.

Our solution? We recess the bottoms of every General Electric 50-kvar capacitor. All that touches the ground is the heavy, double-thickness steel rim. The more vulnerable bottom rarely gets scratched or dented.

Please don't misunderstand us. We don't recommend dragging General Electric capacitors around. But we know that this can't always be avoided. So we've done something about it.

If you still have questions, get in touch with your General Electric Apparatus Sales Engineer. Or, write to General Electric Section 445-4, Schenectady 5, New York.

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GENERAL ELECTRIC

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

Aluminum windings can take it!

Three-year field tests of experimental General Electric distribution transformers prove that aluminum windings have what it takes in case future emergencies tie up copper supplies.

Today 134 unique General Electric distribution transformers, like those shown above, are up on poles across the nation. What's unique? Their windings are *aluminum*.

Field tests prove success

The experimental, aluminum-wound units are the result of 18 months of General Electric research, development and manufacture. Now they have passed their three-year field tests. Utility comments such as "no operating difficulties," "performing satisfactorily," and "no troubles whatsoever" underline the aluminum winding's success.

Exceeds NEMA standards

Experimenting with one of the field-tested units back at the plant, General Electric engineers found that the aluminum winding meet all the standards set for conventional transformers, and greatly exceed NEMA requirements for a new unit. G-E engineering research had met the challenge: the aluminum-wound transformer is a success.

G.E. solved complicated problem

When the problem was first tackled, G.E. decided that the aluminum-coil transformer must meet present electrical and mechanical requirements in spite of the widely different characteristics of copper and aluminum. The problem of thus balancing a lighter-weight conductor with lower conductivity had to be solved; new methods of wire drawing and rolling and coil winding had to be developed; and new brazing and welding techniques adopted. Yet in spite of these difficulties, G-E engineers developed an aluminum-wound transformer. In most ratings, it is virtually an exact size-for-size, weight-for-weight replica of its copper-wound prototype with essentially the same losses and regulation.

AL/CU terminals: early development

When utilities began to consider seriously the use of aluminum line conductors, G.E. recognized that new methods would be needed to tie transformers into the lines. For the "cold-flow" of aluminum causes conventional terminals to loosen. The AL/CU terminal clamp developed by G.E. solves the problem by exerting a constant pressure on the conductor.

All Transformers Are Not Alike

Continued research is only one advantage of General Electric Distribution Transformers. Others include *Formex* wire* for reduction in tank size, *new and improved circuit breakers* for self-protected transformers, *complete warehouse stocks* to save utility inventories, and many others—evidence that all transformers are not alike.

For complete information contact your nearest G-E Apparatus Sales Office or write to Section 431-52 General Electric Company, Schenectady 5, New York. 431-52

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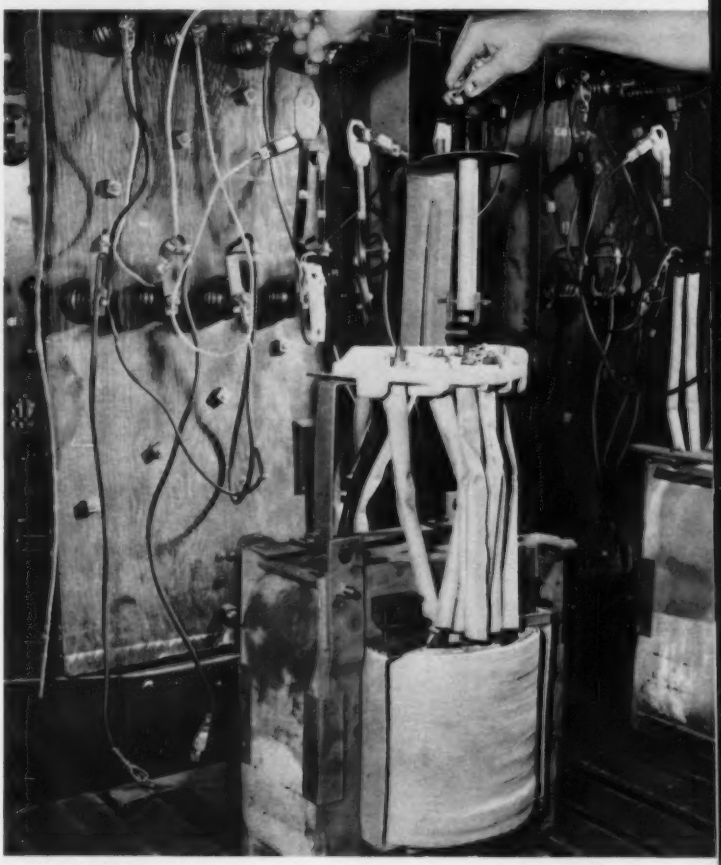
AL/CU TERMINALS on G-E high-voltage bushings save costly service trips by keeping a tight grip on conductors in spite of "cold-flow".



ALUMINUM COIL has passed severe field and factory tests, proving aluminum has what it takes in case copper becomes unavailable.

Progress Is Our Most Important Product

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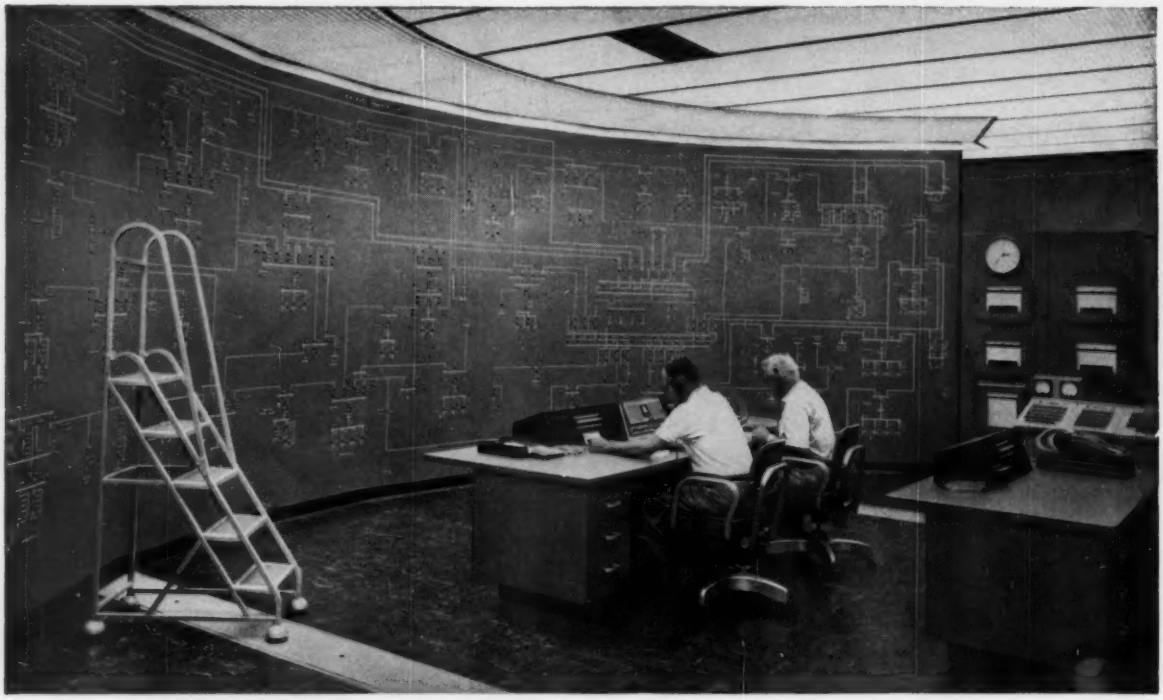


New Jersey Power and Light Reports

GENERAL ELECTRIC PROGRESS LINE TWO-WAY RADIO PROVIDES MAXIMUM COVERAGE

New Progress Line Units Are Assigned Exclusively to Long-range Duty

After replacing many of its 100 mobile radio units with new General Electric Progress Line units, New Jersey Power & Light Company learned that the new G-E units perform so well that they are now assigned to the trucks that operate farthest from their base stations.

Get Greater Range and Better Reception

In addition to the excellent range of operation provided by the new General Electric units, Harold Mann, communications engineer, is enthusiastic about the high-fidelity quality of messages from mobile units. This, he explained, is due largely to the controlled reluctance microphones supplied with all Progress Line mobile units.

The utility's radio system includes 10 base stations throughout the northern half of New Jersey, 5 of which have 450-mc repeaters, and 100 low band 60-watt mobile units.

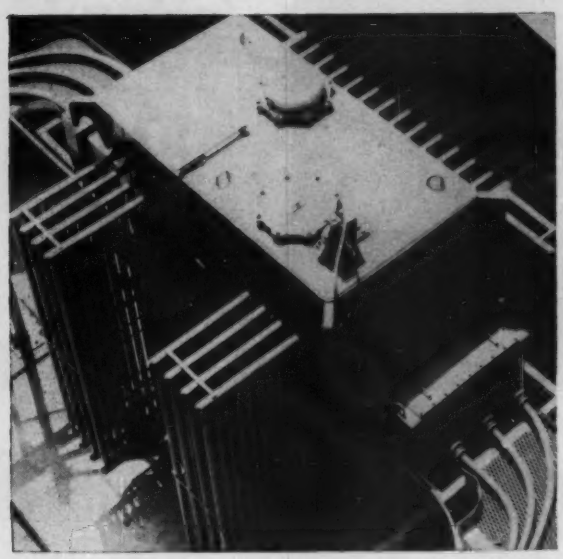
Maintenance of all New Jersey Power & Light Co. radio equipment is provided by the Warner Engineering Company, an authorized General Electric Service Station located in Upper Montclair, N. J.

The utility reports that its 10-year experience with radio has proven a maintenance contract with the General Electric Service Station is more economical than providing service through its own maintenance department, and is equally effective.

For Sales and Service...see "Radio Communication Equipment" in your yellow pages. Or, write: General Electric Company, Communication Equipment, Section C2227-25, Electronics Park, Syracuse, New York. *In Canada:* C.G.E. Electronics, 181 Lansdowne Avenue, Toronto.

Progress Is Our Most Important Product

GENERAL ELECTRIC



TROUGH supports 4-kv, 1,000-MCM, 2.4-kv, 2,000-MCM cable connections on sides of 5,000/6,250-kva tie transformer

GENERATION—Design

Trough Solves Power Distribution Problem

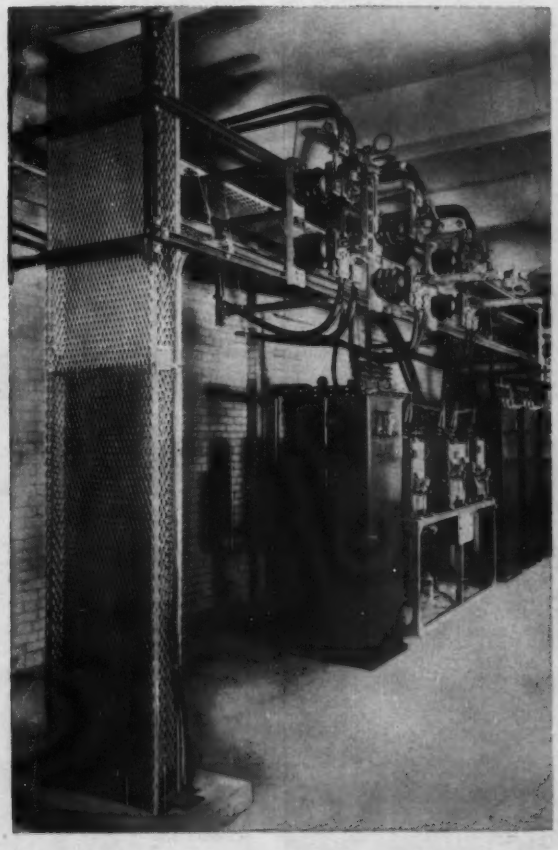
A. B. KLYNE, City Electrician, Dover, Ohio;
JOHN McCUE, William C. Kammerer & Associates

Installing a new 7,500-kw generator in the Dover Electric System posed a space problem. Plenty of space was available for the generator, but precious little below it for extending six 2,000-MCM, 5-kv cables to the city system.

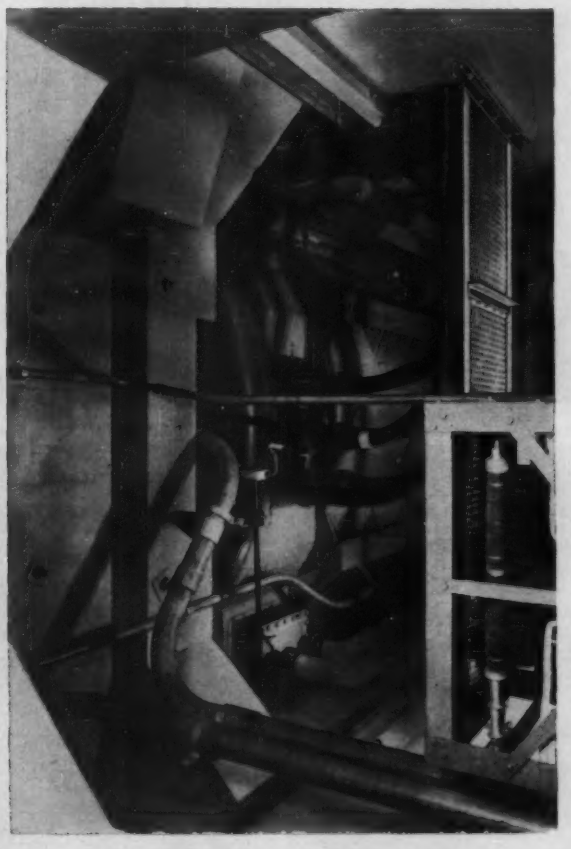
Use of conduit offered mechanical difficulties, and its reduction of current-carrying capacity required large cables which further increased installation problems. Weight of the cables—roughly 9 lb per ft—required a rigid, rugged support system. But expanded metal cable trough suited eminently.

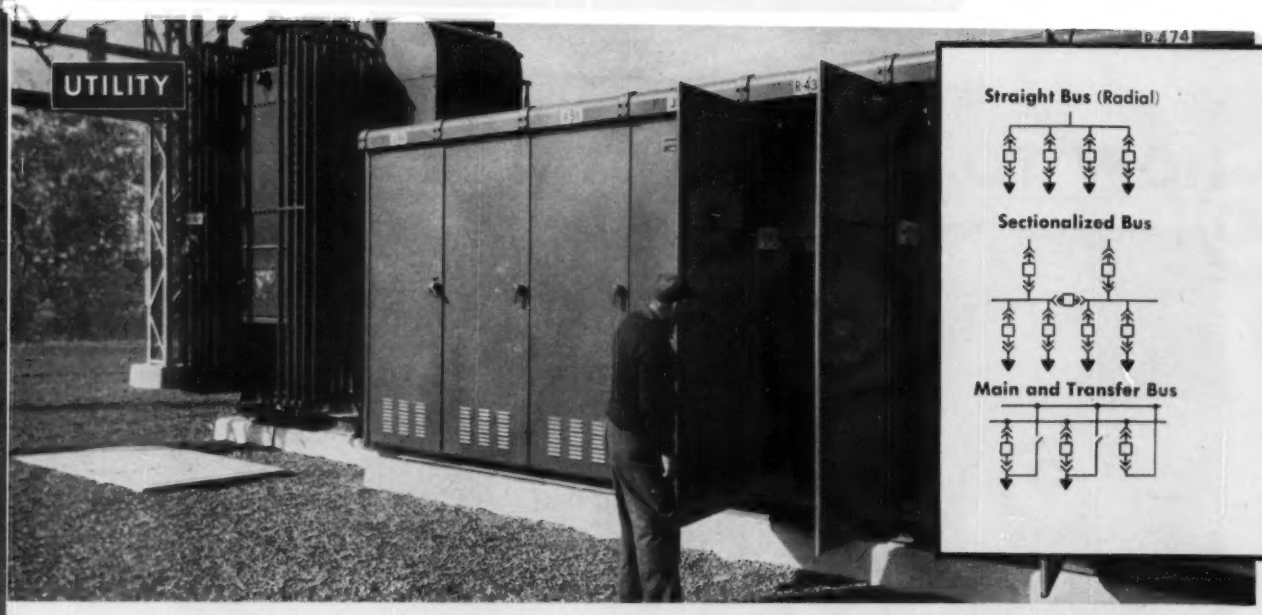
(*More How To on page* 70)

TWO TROUGHS back to back support 18-single-conductor 500-MCM cables, carrying them into distribution system

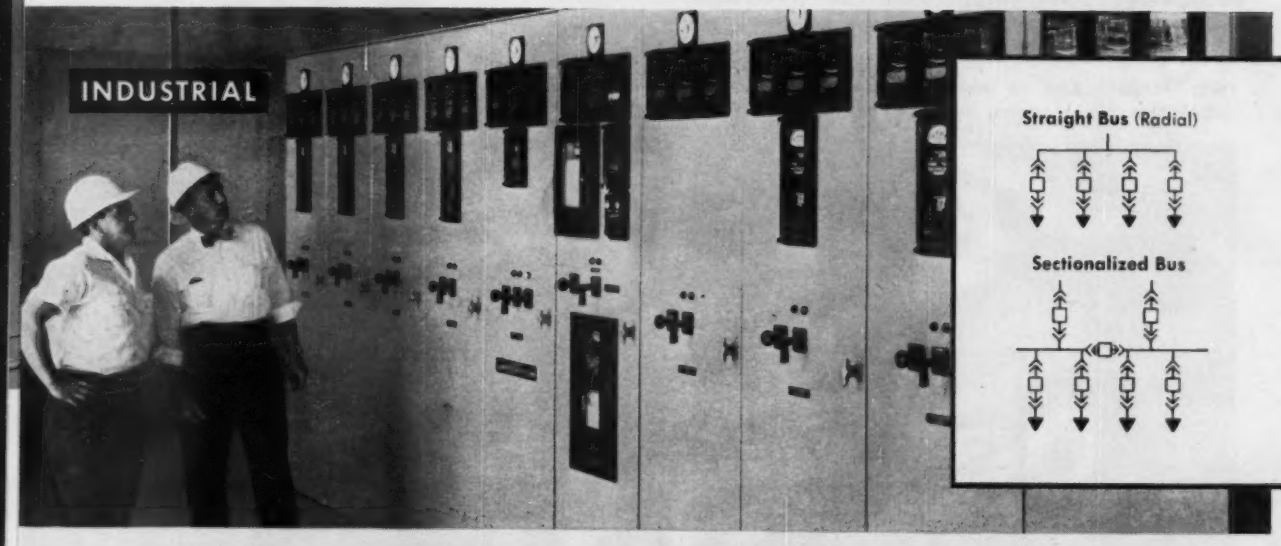


CABLES from generator are supported by 24-in. wide cable trough, which can support approximately 350 lb of cable

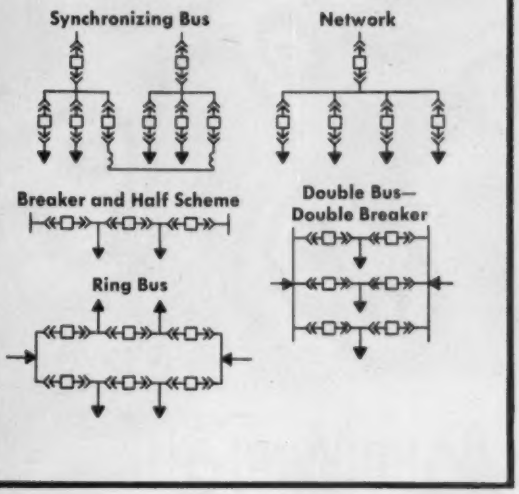




Whatever the application — General



General Electric Metal-clad Switchgear is being used more and more for commercial installations such as large buildings, department stores and shopping centers, where maximum protection and continuity of electric power service is important. These basic switching schemes meet the requirements of most installations.



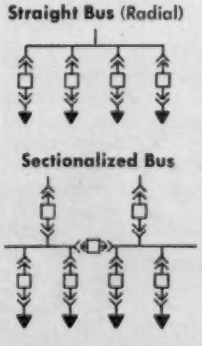
FUNCTIONAL SWITCHING SCHEMES FOR ALL MEDIUM-VOLTAGE APPLICATIONS

- Incoming Line and Service Entrance
- Bus Tie
- Utility Reclosing Feeders
- Industrial Feeders
- A.C. Generator and Exciter Control
- Synchronous Motor Starting
- Induction Motor Starting
- Indoor and Outdoor Substations
- Mercury Arc Rectifiers
- Arc Furnace Service
- Capacitor Switching
- Synchronous Condenser Control

APPLICABLE FOR: Power House Auxiliary Motor Control—Main Generator Control for Small and Medium Steam, Hydro and Gas Turbine Plants—Utility Distribution Systems—Waterworks and Sewage Plants—Oil Pipeline Pumping Stations—Refineries—Manufacturing Plants of All Kinds—Armed Forces Installations—Large Commercial Buildings—Shopping Centers.

Electric Metal-clad Switchgear handles any switching problem—economically!

These two switching schemes meet the basic requirements of most industrial installations, including textile mills, refineries, mining operations, and automobile and similar manufacturing plants. For more extensive and specialized applications, refer to the additional switching schemes shown above.



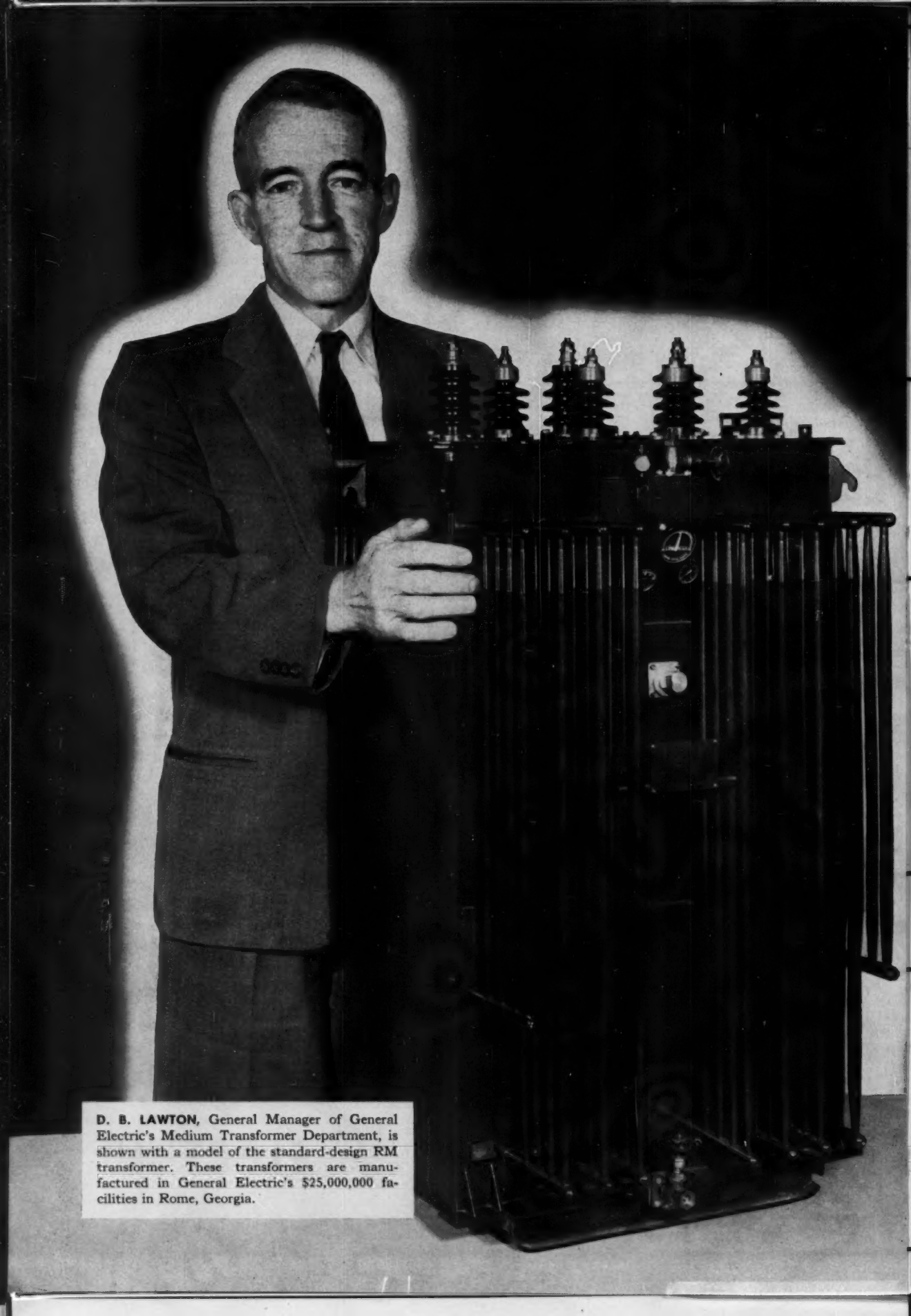
General Electric factory-assembled Metal-clad Switchgear is the best answer for switching schemes in the medium-voltage range of 2400 to 13,800 volts.

This universal application, combined with the advantages offered by standardized unit design, greatly simplifies engineering and installation of metal-clad switchgear equipment. Maintenance and operation present fewer problems because personnel have only to learn the details of one type of equipment. And with standardized design, spare parts requirements are minimized because one set of parts will serve for all installations. Removable Magne-blast circuit breakers of like rating, for example, are interchangeable, so that one spare unit can serve for emergency use on numerous circuits.

General Electric Metal-clad Switchgear is built for rugged duty. It provides maximum protection for electrical systems and the highest level of safety for personnel. For full information on its many "plus" features, see your local G-E Apparatus Sales Engineer, or write for Bulletin GEA-5664 to General Electric Company, Section 511-20, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



D. B. LAWTON, General Manager of General Electric's Medium Transformer Department, is shown with a model of the standard-design RM transformer. These transformers are manufactured in General Electric's $25,000,000 facilities in Rome, Georgia.

A GENERAL ELECTRIC 10-YEAR FORECAST:

$40,000,000 electric utility savings with medium transformer standardization

Based on today's eight percent lower price of standard ratings compared with specials, America's electric utilities stand to save—in the next 10 years—more than $40,000,000 on medium transformers (501 to 7500 kva, 69 kv and below). So forecasts D. B. Lawton, General Manager of General Electric's Medium Transformer Department, Rome, Georgia.

This $40,000,000 savings figure is conservative. Based on present standard-versus-special buying practice, it will be greatly exceeded if the utility industry continues to increase its acceptance of standards as in the past few years.

The tremendous saving due to lower prices is but one of the many benefits of medium transformer standardization. The modern, repetitive manufacturing facility put in place by General Electric at Rome in 1953 also makes possible:

Faster shipment—Ten-week shipment is now average for General Electric RM medium transformers. This compares with an industry average of more than 16 weeks for specials.

More and better features—Standard design has made it economically possible for General Electric to offer such important extras as Formex* insulated windings, control-center arrangement of instruments and accessories, reversible junction boxes, full drain, and many others.

Higher quality for longer life—General Electric repetitive manufacture techniques permit 18 assembly-line tests and 22 quality control inspections during manufacture, to assure dependable operation over a long service life.

G.E.'S BROAD RANGE OF STANDARDS HANDLES 90% OF ALL JOBS

If your company is not yet taking full advantage of the large dollar savings and other key benefits of medium transformer standardization, act today. Ask your G-E Apparatus Sales Engineer to show you how G.E.'s broad range of standard RM medium transformers can meet the large bulk of your needs, work efficiently with older, special transformers now on your system. General Electric Company, Schenectady 5, New York. 416-7

*Reg. Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

Corn-Cob Dust Cuts Hydro Cleaning Cost

HUGH R. DANIELS, Sr. Hydro Engineer, Dept. of Electric Operation, Pacific Gas & Electric Co, San Francisco, Calif.

Dry-cleaning of hydro generator rotor and stator windings with corn-cob dust costs about 60% less than the manual cleaning methods previously used by maintenance crews of Pacific Gas & Electric Co. The dry-cleaning process leaves generator windings far cleaner and also cleans air ducts and iron more effectively than former methods.

The new method also affords a dry surface on coil ends receptive to new varnish. Hand-cleaning tended to leave an oily film.

The new cleaning process has eliminated the need for large labor crews using a variety of brushes and solvents to dislodge accumulated dirt, oil, dust, and insects. Including overhead charges, but excluding "down-time" costs where assessable, the manual method averaged $875 per machine and required 40 man-days. The dry-cleaning process, under average conditions, costs $375 per machine and takes 15 man-days.

Dust Blown at 60 psi

The dry-cleaning scheme employs a portable sand blaster for applying corn-cob dust, a light abrasive, under air pressure to outside surfaces of stator coils, field windings, machine covers, and air ducts. For best results, the dust should be blown at about 60 psi at the nozzle orifice, the gun held at least 60 in. from the target. The high-pressure air must be filtered to eliminate moisture.

Where oil and dirt deposits form a gummy coating on windings, safety solvent is applied lightly over the area 30 min before cleaning. The solvent loosens the coating sufficiently to make the corn-cob dust effective.

As a preliminary step to cleaning a generator, the unit is covered with canvas housing to confine the dust. With suitable precautions, contamination of journal housings and oil wells can be avoided. These precautions are called for even though most dust falls into the generator pit from where it is removed by a vacuum cleaner. Dust remaining in air ducts is removed with a low-pressure, air blow-down. Although the dust can be reclaimed for re-use by screening, its relatively low price makes salvage questionable.

When applying corn-cob dust under pressure, personnel handling the air-blast nozzle should be equipped with dust goggles and a simple filter-type respiratory mask. In one PG&E division, the man on the nozzle wears a light-weight canvas dust hood which provides wide visability. A stream of air introduced into the hood prevents the entrance of dust and provides greater comfort during the operation.

Corn cob dust does not present any danger of accidental combustion. In adequate natural ventilation, the dust does not concentrate enough to produce a combustible mixture.

High-voltage Tests Show Results of Cleaning

First case: 6.6-kv, 4-Mw unit, with class A insulation 29 years old

	Leakage Current, ma						
	Before				After*		
Voltage, kv	A	B	C	(Phase)	A	B	C
5	30	50	30		5	5	5
7	75	110	75		7	7	7
9	150	220	1,000+				
10	200	290	.....		10	10	10
11	300	390	.....				
12	450	550	.....		11	11	11
13	Test Stopped						
14					13	13	13
15					15	15	15

Second case: 2.3-kv, 2-Mw unit, with class B composite insulation 47 years old

1	28	0.5	23	....	....	...
2	64	0.5	62–90	....	....	...
3	148	30	**	0.5	1	0.5
4	Test Stopped			0.5	2	0.5
5				0.7	4	0.7
6				1	5	1

* Test made on unit in first case two weeks after machine was in service.
** Fluctuating reading.

Paper Bags Facilitate Transformer Painting

G. ROBERTS, Superintendent, Transformer Department, The Toledo Edison Co, Toledo, Ohio

Ordinary brown paper bags, such as are found in a grocery store, reduce the cost of painting transformers in the transformer department of the Toledo Edison Co. The paper bag is put over the bushing and secured with a rubber band to mask the bushing while the transformer is being spray painted.

The bags are used in preference to masking paint because of considerable savings in material, labor, and time. Experience has indicated a 75% saving in the cost of preparing transformers for a paint job.

The bags cost $2 per 1,000 and rubber bands $1.80 per lb, or 90¢ per 1,000. Masking paint is $4.20 per gal (for 500 bushings) or $8.40 per 1,000 bushings. Labor costs are $24 per 1,000 bushings when the bags are used, compared with $90 for the other procedure.

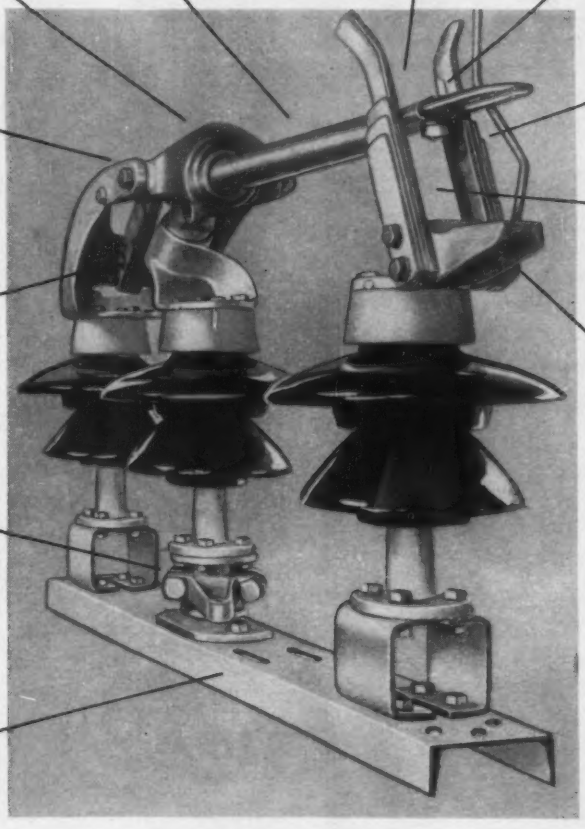
This unmatched combination of features proves it . . .

Exceptionally high contact pressure—provides maximum current-carrying capacity—cleans during operation.

Fully controlled blade in all positions.

Large contact deflection — maintains high-pressure contact over long life.

Corrosion and abrasion-resisting silver-to-copper contacts for high conductivity.



Simplified, rugged factory-sealed ball bearing blade-actuating mechanism for smooth operation. Blade is locked in open and closed position.

Independent pressure-applying spring and current-carrying members in contacts. No small contact springs. No dual function parts.

Contacts fully visible for thorough inspection.

Minimum number of moving parts — for efficient, easy, dependable operation.

Minimum number of current interchanges — for maximum electrical efficiency.

Permanently sealed rotating insulator bearing — prevents moisture, dirt accumulation. Ease of operation assured.

Sturdiest possible construction — built to outperform and outlast other switches.

For ultimate low cost, you can't beat Delta-Star MK-40 Switches

The sum of components produces an *unequalled* air switch . . . because, considering all features, the Delta-Star MK-40 stands out for its highly efficient, long, dependable service at low ultimate cost.

Other switches may look like the Delta-Star MK-40, but they do not necessarily perform the same. In such other switches, even minor changes in bearing centers, or an extra link in the mechanism only introduce needless complications and small parts that may detract from top performance.

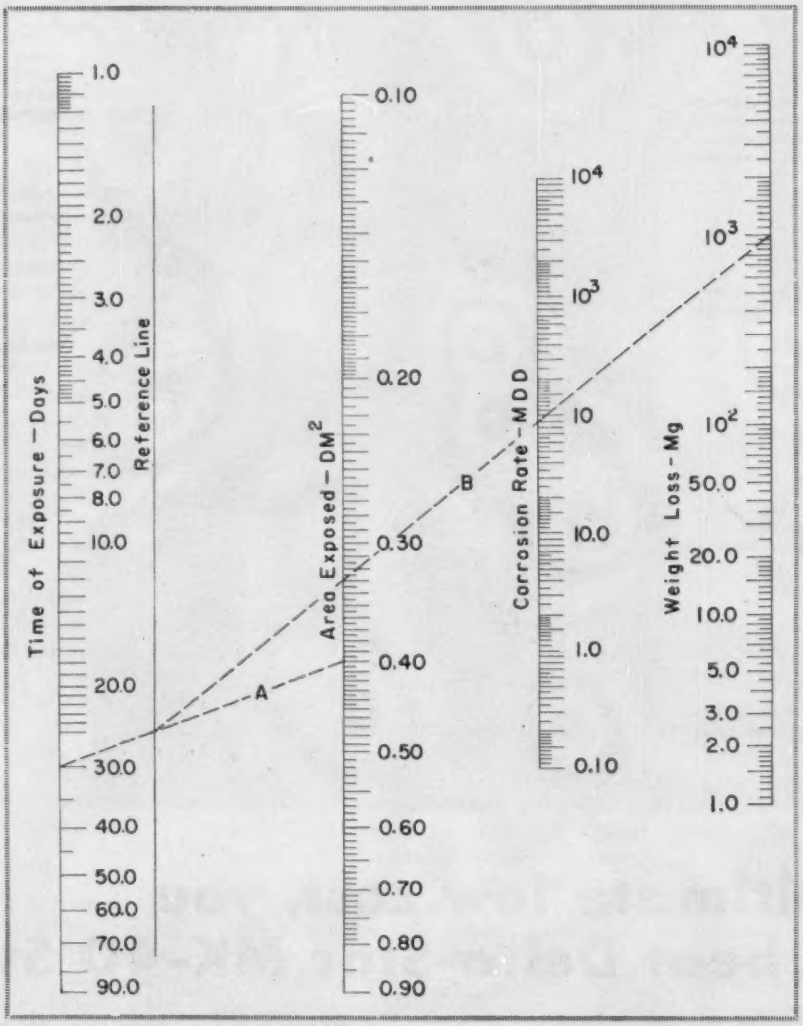
For your consistently best buy in air switches, specify the Delta-Star MK-40. *Delta-Star Electric Division, H. K. Porter Company, Inc., Chicago 12, Illinois. District offices in principal cities.*

HKP DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Connors Steel, Delta-Star Electric, Henry Disston, Laclede-Christy, Leschen Wire Rope, McLain Fire Brick, Quaker Rubber, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings.

Corrosion Rate in Milligrams per Day



Nomograph solves graphically the rate of corrosion of various metals and alloys as expressed by the equation:

$$MDD = MG/DM^2/D$$

where MDD = corrosion rate of specimen in milligrams per day; MG = weight loss of specimen in milligrams; DM^2 = area of specimen exposed in square decimeters; and, D = exposure time in days.

Example for use of Graph

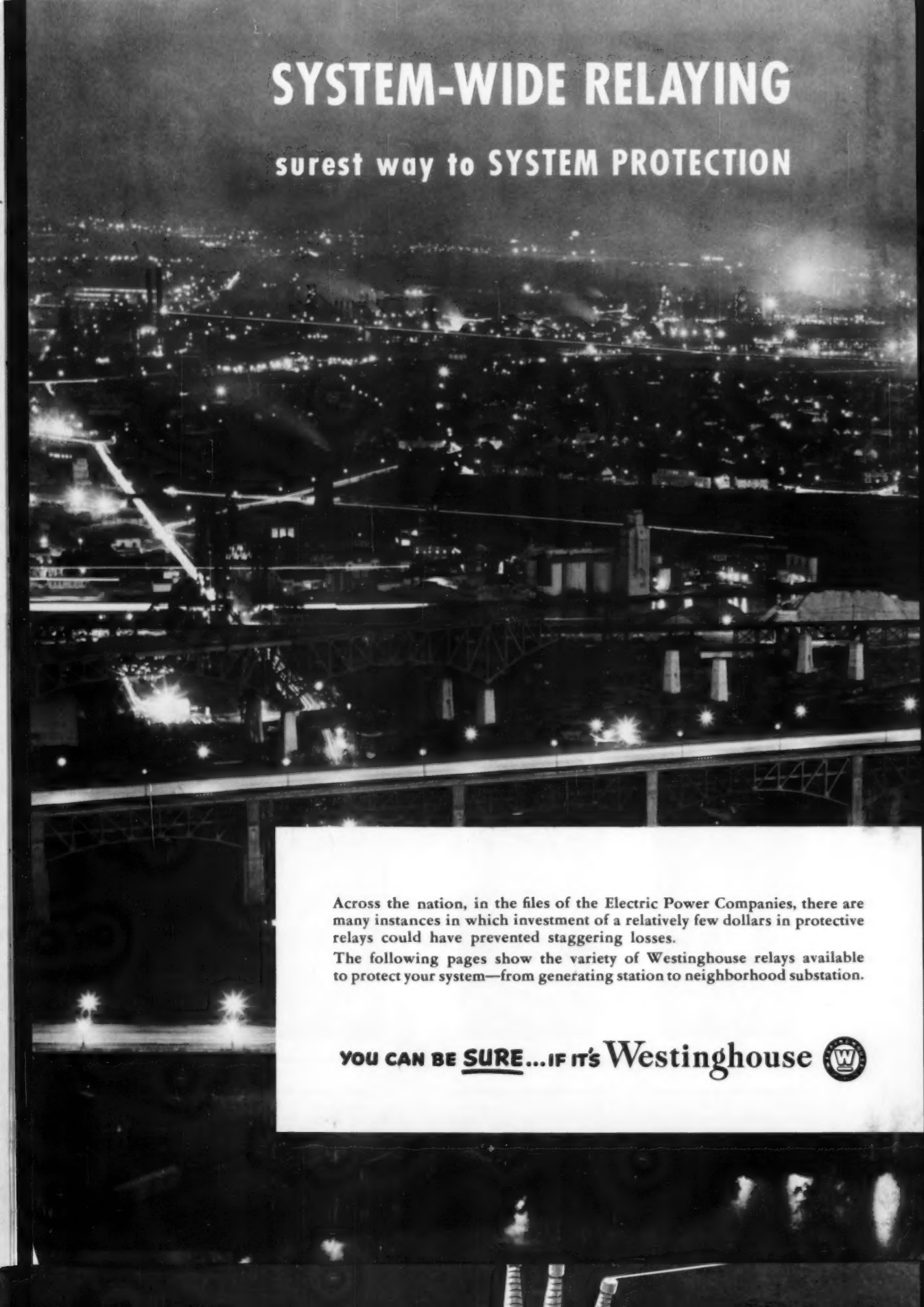
Problem: If, after exposing a certain metal or alloy to a corrosive environment for a 30-day period, it is found that the weight lost by the specimen is 1,000 milligrams, what is the corrosion rate? Area of specimen determined before the test was 0.40 DM^2.

Solution: Refer to nomograph. Connect the days of exposure, 30, and the area of the specimen exposed, 0.40 DM^2, with a straight edge (dash line A) to intersect the reference line.

At the intersection of dash line A with reference line, connect this point and the weight lost by the specimen, 1,000 MG, with a straight edge (dash line B). Where line B crosses the corrosion rate scale, read the corrosion rate as 90 milligrams/DM^2/day.

1. Adapted from "Nomograph for Making Corrosion Rate Calculations" by W. A. Szymanski; CORROSION, Vol. 10, No. 12, p. 423.

2. Another nomograph to calculate corrosion rate in inches penetration per year (IPY), and to convert MDD to IPY, will appear in a subsequent issue.



SYSTEM-WIDE RELAYING

surest way to SYSTEM PROTECTION

Across the nation, in the files of the Electric Power Companies, there are many instances in which investment of a relatively few dollars in protective relays could have prevented staggering losses.

The following pages show the variety of Westinghouse relays available to protect your system—from generating station to neighborhood substation.

YOU CAN BE **SURE**... IF IT'S Westinghouse

Optimum station relaying

. . . early warning plus emergency stop for "protection in depth"

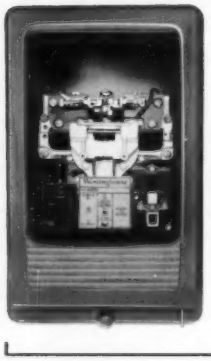
Any fault in a generator, bus or power transformer is real trouble—but adequate detection, early warning and reliable tripping can minimize equipment damage and prevent complete replacement . . . with brief outages rather than extended ones. Advance warning of impending trouble is often just as important as clearing faulted apparatus from the system. The key to optimum protection is "defense in depth."

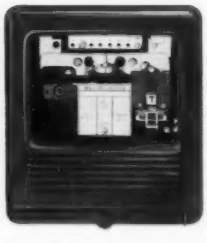
Below is a representative group of Westinghouse relays for generating stations. They incorporate the unparalleled design for performance and reliability that has made Westinghouse the unquestioned leader in the field. Housed in Flexitest* cases, they give you greater accessibility for maintenance and testing—simple interchangeability. Your Westinghouse sales office has complete information.

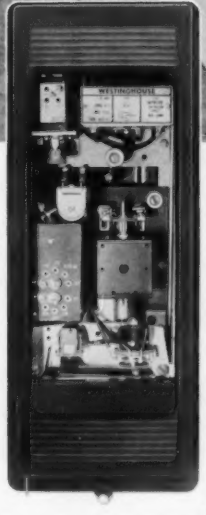
*Trade-Mark

YOU CAN BE SURE...IF IT'S

Westinghouse







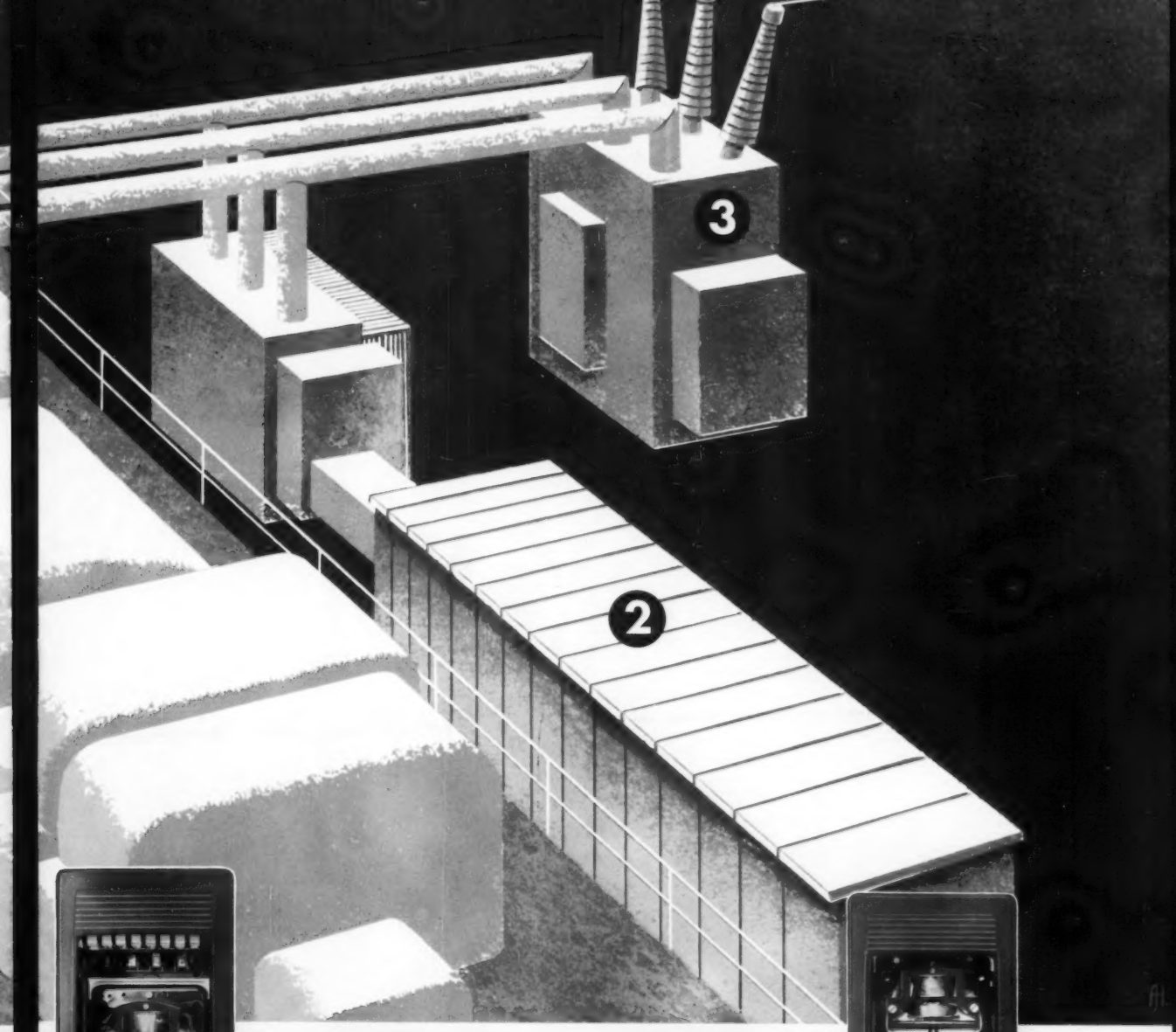
1

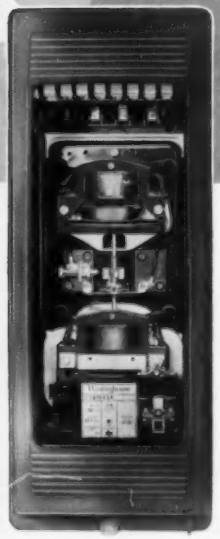
CA—Generator Differential Relay—Basic generator protection for phase and ground faults. It initiates tripping of turbine throttle, main breaker, field breaker—and application of CO_2 extinguishers, if they are used.

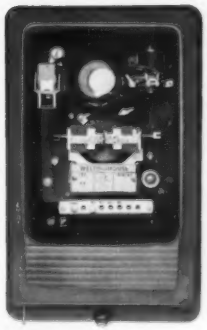
CV-8—Sensitive Generator Ground-Fault Protection—This relay will warn the operator or trip breakers, as you choose. It serves as early detection of minor faults—warns or acts before serious damage can occur. It has self-contained third harmonic filter.

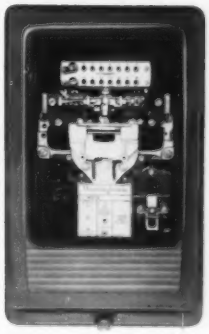
COQ—Generator Negative Sequence Relay—This unit sounds alarm or trips breakers in the event of unbalanced system conditions which could result in generator damage due to rotor overheating.

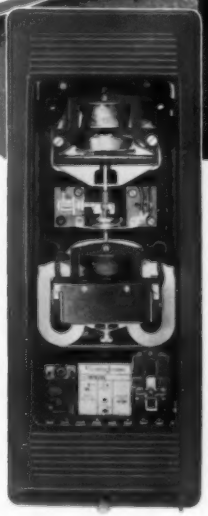
HLF—Generator Loss of Field Relay—This device sounds an alarm when the machine operates too far into the leading power-factor region and trips the generator breakers in the presence of low terminal voltage due to partial or complete loss of field.











2

3

CA-6—Bus Differential Relay—Basic protection against phase or ground faults on major buses. It trips all generator and line breakers associated with the faulted bus section.

LC—Linear Coupler Bus Differential Relay — High-speed, extra-sensitive, relay to trip all generator and line breakers associated with faulted bus section. Air-core design of linear coupler eliminates errors of current transformer iron saturation.

CA—Transformer Differential Relay—This unit detects faults in transformer bushings and transformer windings. The action provides fast tripping of all associated breakers. The unit employs self-contained current balancing taps.

CA-4—Three-Winding Transformer Differential Relay—This specialized unit offers the same protection for three-winding transformers as does the CA for two-winding transformers.

Transmission protection by carrier relaying

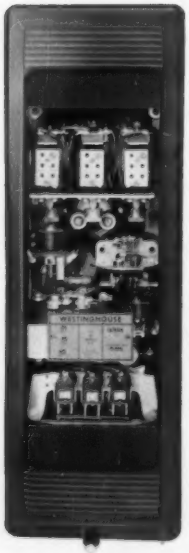
. . . assured continuity and stability through simultaneous tripping and isolation of faulted section

Isolation and location of faulted transmission line sections, with the least possible disturbance to the system, can reach its greatest effectiveness only through comparative intelligence which will allow simultaneous tripping and high-speed reclosing at both ends of faulted line sections.

Westinghouse directional-distance carrier relaying provides the ultimate in high-speed protection of transmission lines — and in flexibility of application.

The comparative intelligence coordination is provided by carrier relaying of the Type KR for most applications. For lines with unusually high attenuation or noise level, frequency shift carrier or special anti-noise equipments can be used to provide efficient and dependable service.

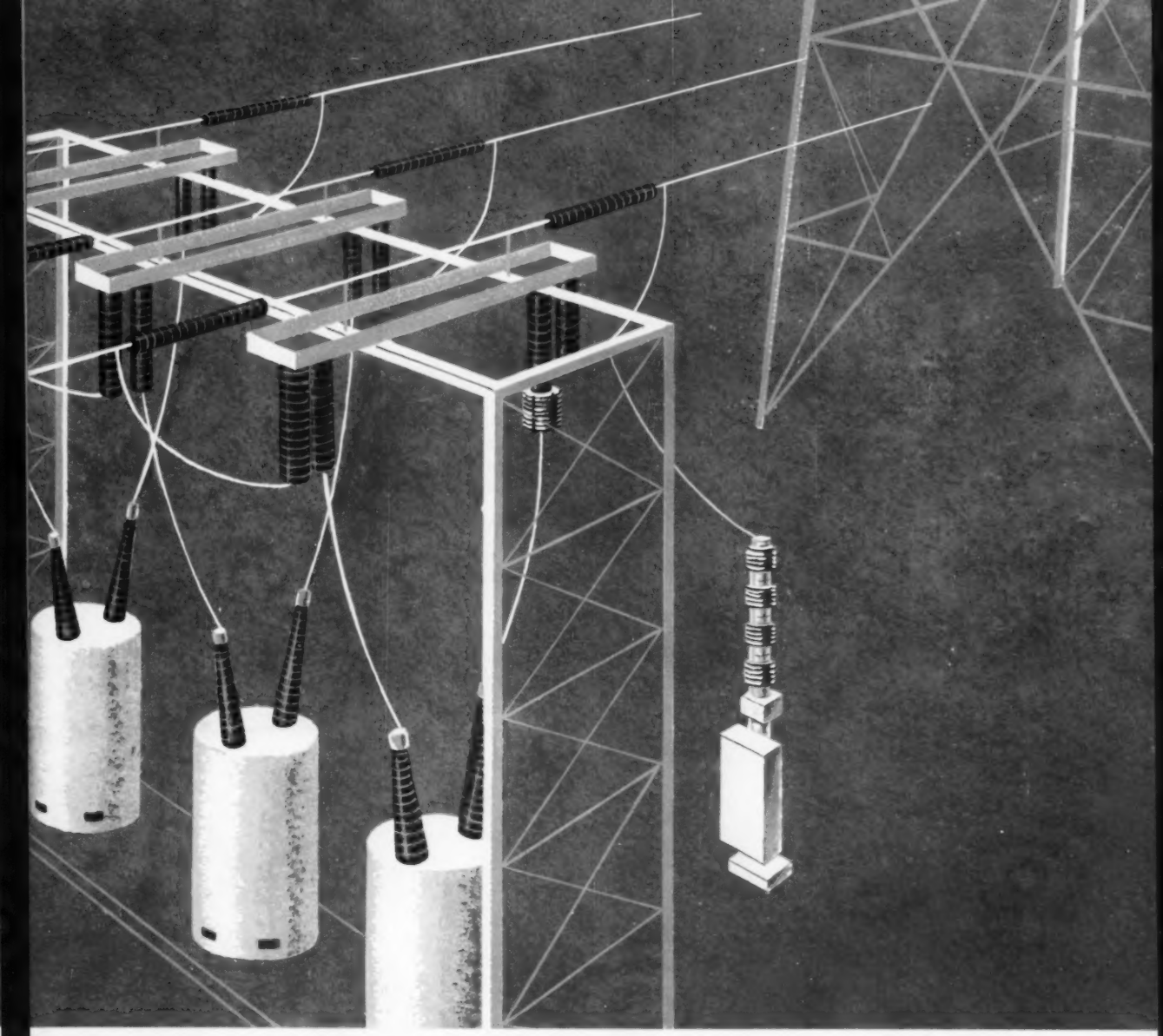
This page illustrates HZ, HZ-4 and HZM relays which can be carrier coordinated — including frequency-shift applications. Complete application information and specifications are available from your Westinghouse sales office — or from Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.



Type HZ (at left) is the basic directional-distance relay for high-speed protection of transmission lines. Type HZ-4, not shown, but similar in appearance, is a high-speed, sensitive, directional-distance unit especially suited to heavily loaded short lines where phase angle discrimination is necessary between load and fault impedance in the third zone. Type HZM, also similar in appearance, is the best and most efficient, flexible protection for long-line and high angle-line application.

YOU CAN BE SURE...IF IT'S

Westinghouse



COMPLETELY TRANSISTORIZED CARRIER

The All-New Type KR

Ever since "miracle" transistors were announced a few years ago, everyone has agreed that they would revolutionize the application of electronics . . . They have done just that to Westinghouse power line carrier.

Tested since 1953 under regular utility service conditions, Type KR carrier has been in regular commercial service since June, 1955. Here's what the testing under actual service conditions has proved:

1. It has all the advantages of the Westinghouse carrier you have been using — PLUS —
2. Cuts your maintenance costs—because of the extreme long life of transistors.
3. Uses no floor space at all — Flexitest* case mounted compared with conventional 18 cubic foot cubicle construction.
4. Cuts your battery system requirements — from 250 watts to less than 25 watts per set.
5. Printed circuits, plug connectors, Flexitest case mounting, simplified adjustment and greatly improved selectivity — provides rugged stability and additional channel possibilities.

Complete details are yours for the asking at your nearby Westinghouse sales office. Ask about Microwave, too. It will implement your present system if you need more channels — give you a big advantage in rough terrain.

*Trademark

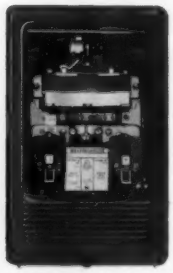
Distribution relaying upgrades service . . . gives top protection, too

It's epidemic! Growing pains in distribution systems. If space is at a premium in your substations—and it undoubtedly is—then new CO and CR relays, reduced in size by one-third, offer you a big advantage. You can use them in modernization programs—revision of old systems into reconnected loop systems. You gain in space required—eight relays where only five could be accommodated before. And, in addition, you gain the Flexitest case features—including chassis pull-out test facilities and strap connections to eliminate the maze of wires.

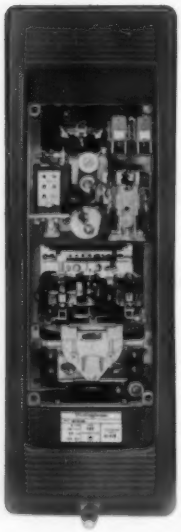
The basic relays are the CO (overcurrent) and the CR (directional overcurrent). In addition, the HRZ is available where a high-speed distance unit with timed back-up is particularly important.

Incidentally, space-saving, important as it is, is not the whole story. Talk to your Westinghouse relay specialist about the improved operating characteristics, lower burdens and other features of the completely redesigned series of overcurrent and directional relays.

Type CO overcurrent relay.



Type CR directional overcurrent relay.

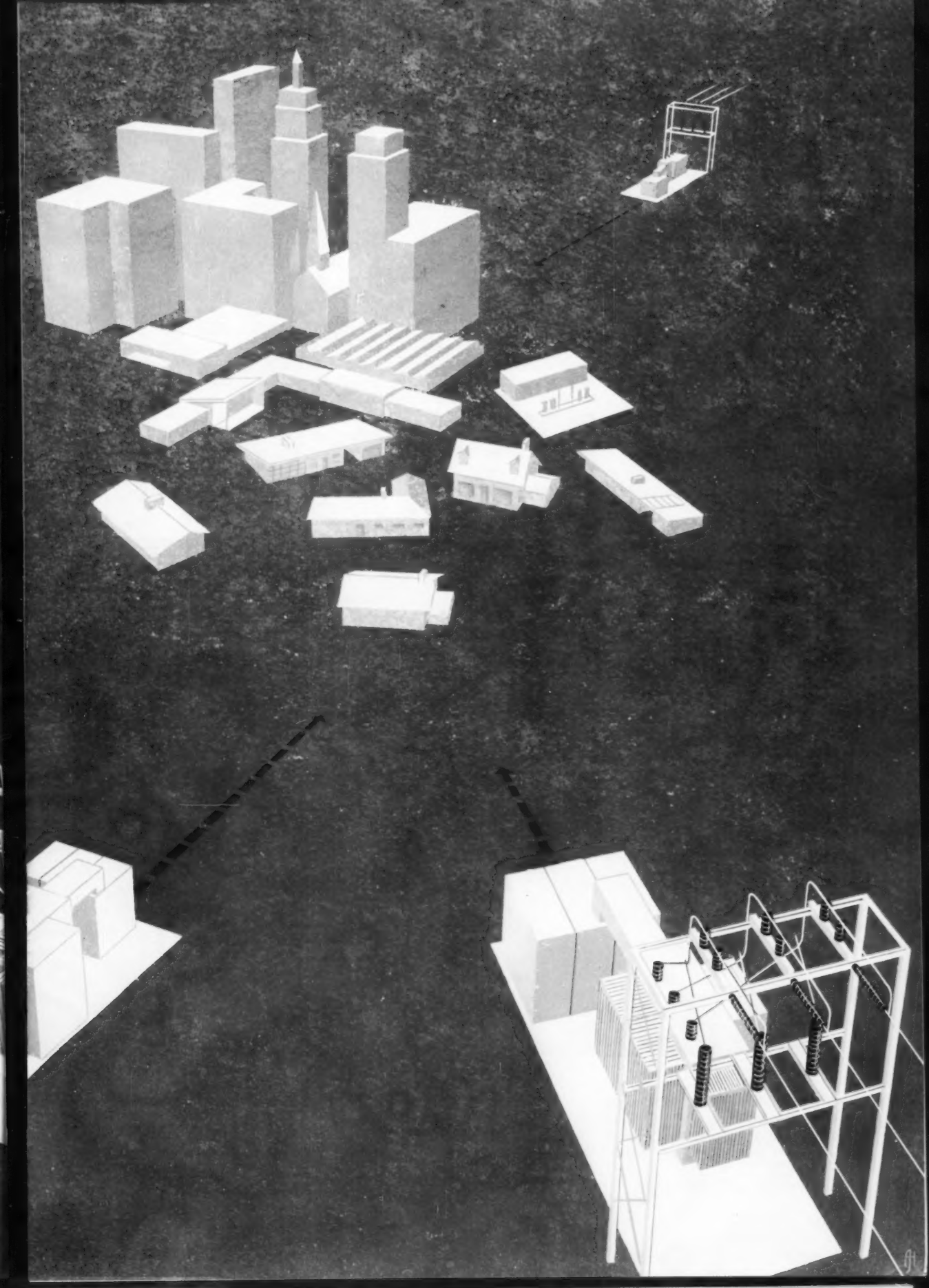


HRZ—High-Speed Protection Coordinated With Existing Low-Speed Relays

High-speed phase protection for 90% of a line section plus inverse time backup is available in HRZ directional overcurrent impedance relays. This relay is ideally suited for subtransmission lines where it is often desirable to provide high-speed protection and effective coordination with induction disc relays on adjacent line sections of the system.

YOU CAN BE SURE...IF IT'S

Westinghouse



This engineering team can beat trouble to the draw

Today's—and tomorrow's—fantastic appetite for and dependence on electric energy makes prolonged system outages and extensive equipment damage more intolerable than ever. *Planned* system relaying meets the problem head-on.

Minimizing equipment damage and system disturbance is accomplished only when system design and relay application are a coordinated effort. This requires close cooperation between the system planning engineer, the transmission and distribution engineer and the relay engineer. The Westinghouse relay and system engineers can also be valuable additions to the coordination team. These men can operate with outstanding effectiveness in the prime interest of the Electric Power Company—adequately protecting a tremendous capital investment—and insuring the optimum in customer service.

CP 1039

YOU CAN BE **SURE**...IF IT'S

Westinghouse

'57 LBE Plans Launched by TV

John Daly clowns with Giselle MacKenzie during the recent coast-to-coast closed-circuit telecast that kicked off the 1957 Live Better . . . Electrically promotion program. Originating "live" from New York City, the show was beamed to 53 cities across the country, where industry people—utility men, manufacturers, distributors, contractors, dealers and others—met to celebrate LBE's first birthday.

LBE's 1956 accomplishments were first reviewed. Then the activities for '57 were spotlighted in the hour-long program. As in 1956, Daly and MacKenzie outlined the coming year's aims:

Utilities are going to expand their LBE promotions by intensifying local advertising, publicity and other promotional efforts. They will pay special attention to their home service departments—witness the first LBE women's conference in Chicago last month.

Manufacturers will integrate LBE themes more thoroughly into their own promotion plans. In addition, they will develop some specific LBE plans for themselves. Considerable manufacturer support is expected.

Associations also will work the theme into their plans, emphasizing coordination between LBE and other industry promotion programs, such as EEI's HOUSEPOWER and those of NAWB and NECA.

Trade Allies—the banks and leanding institutions—have indicated that they consider LBE a good stimulus in helping them boost financing of home modernization projects, especially those involving rewiring. The American Bankers Association 1956 program to member banks stressed Live Better . . . Electrically as a fresh approach to help to increase lending volume. It is expected they will do again in 1957.

Nationally, the LBE program will use every medium to awaken people to the benefits of electrical living. 1956 promotions will be refined and expanded for '57; national consumer advertising will appear in 11 of the leading magazines; there will be new merchandising aids and promotion kits, newspaper supplements and publicity; a heavy ad program in the trade and business magazines; and increased national TV time. In addition, regular national activities will be supplemented by campaigns in the home building and home economics fields.

'Red' Motley Calls for Competitive Spirit

Arthur (Red) Motley, publisher of *Parade,* addressed the New York luncheon following the telecast.

In a colorful, spicy speech, Motley claimed, "The unprecedented success of the Live Better . . . Electrically program has in no sense lessened the need for aggressive salesmanship on the part of the manufacturers, distributors, and dealers.

"It has created a wider market and sustained a healthier selling climate for electrical products and equipment for the home. But within this framework, there is need for a greater competitive spirit than ever before if all segments of the electrical industry are to get their shares of the electrical sales business."

Sponsors AW Contractors' Contest

Better Homes and Gardens, the national consumer magazine, is sponsoring an adequate wiring contest for all electrical contractors and their employees in the U. S. and its possessions.

The purposes of the contest, according to *B H & G,* are threefold:

(1) To learn from contractors what sales techniques in selling wiring are most successful, and to pass them on to the industry.

(2) To stimulate contractors to sell more home wiring, and

(3) To give consumers more convenient living in better homes.

The contest is receiving wide industry support. Associations backing it include EEI, NECA, NAWB, NAED, and LBE. Utilities also will be asked to lend a hand.

Utilities should be interested since more adequate wiring usually means greater load building. Dealers, also, may be able to expect an increase in appliance sales.

The contest begins April 1 and closes June 30, 1957. All entries must be in by July 15, and in order to be eligible for entry, must have been completed after Jan. 1, 1957. Winners will be announced Sept. 1.

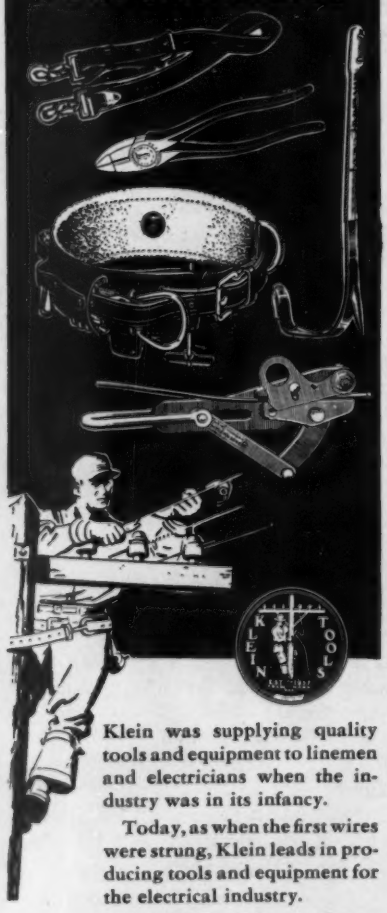
Entries will be judged on usability of selling techniques by others, originality and simplicity.

For further information, prospective contestants should contact the Adequate Wiring Contest Editor, Better Homes & Gardens, Des Moines 3, Iowa.

(*More Selling on page* 84)

KLEIN

FOR GREATER SAFETY, BETTER PERFORMANCE



Klein was supplying quality tools and equipment to linemen and electricians when the industry was in its infancy.

Today, as when the first wires were strung, Klein leads in producing tools and equipment for the electrical industry.

The third and fourth generations of Kleins are still adhering to the quality standards set a century ago. The new Klein plant, equipped with the latest in manufacturing facilities, assures better, safer equipment, wherever power lines or communication lines are strung.

100 years of service to linemen, electricians and industry is back of this new Pocket Tool Guide No. 100. A copy will be sent to you on request, without obligation.

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

Heat Pump in 4,500-5,000 Deg-Days

At the recent Electrical World Electric Space Heating and Heat Pump Conference John B. Taylor, vice president, Atlantic City Electric Co, Atlantic City, N. J., discussed his company's experience with 26 residential heat pump installations during the 1955-56 heating and cooling season (EW, Jan. 21, 1956 p 85).

Much of Mr. Taylor's remarks were considered of importance and interest to utilities.

By way of repitition, the 26 homes metered are located in a climate having a heating season varying from 4,500 to 5,000 degree-days. They average 1,765 sq ft per home, and vary from 1,000 to 4,500 sq ft. Average connected load per home is including all appliances is 39 kw with an average measured demand of 17.2 kw. Average annual consumption of energy amounted to 34,100 kwhr for the 1955-56 heating and cooling season.

In addition to Atlantic City Electric Co's previously discussed experiences in servicing, transformer loading, and other system problems, they learned several other important lessons in connection with the neat pump for residential use.

• Homes must be well insulated for the heat pump as they would be for a successful resistance-heated house.

• The duct runs in crawl spaces under the house or in the attic spaces must also be equally well insulated.

• Air-to-air heat pumps must be sized to provide adequate heating capacity without depending on booster units down to 20 F.

(Violation of the above rules will result in high demands, high energy consumption, and of course, high bills.)

• The demand and energy consumption of the water source heat pump is materially lower than the air-to-air heat pump, although the problem of the water supply and disposal must be solved. (This can be costly.)

• The circulating fan must *not* be reduced in speed to cut down on noise. Doing so only results in rapidly decreasing the efficiency of the combined unit.

"Finally", according to Taylor, "We believe that we must look to the manufacturer for two major improvements in the future. These are: solution of the noise problem and attainment of a field coefficiency of performance of over 3 to 1. When these two problems have been solved with the expected reduction in manufacturing costs resulting from mass production, we will be a long way on the road to real consumer acceptance of the heat pump in our climate."

H & C BRIEFS

Project Goes Radiant

Electric space heating is offered home buyers for first time on a project basis, reports Commonwealth Edison, Chicago. Builders have two model homes with baseboard units. Each has a pair of 1½-ton air conditioning units.

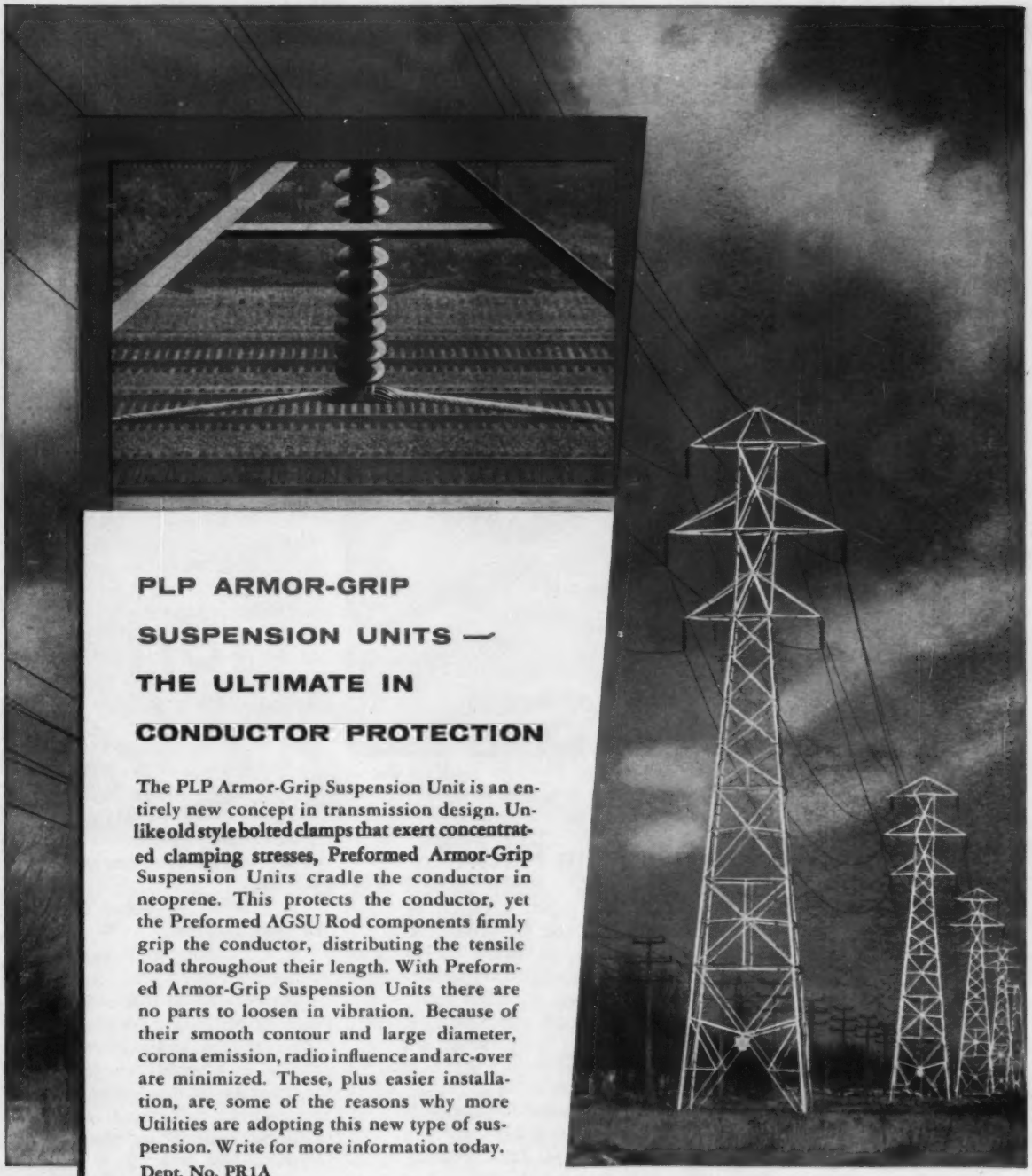
Big Air Conditioning Market

Air Conditioning and Refrigeration Institute was told recently by DuPont market researchers that a retail potention of 250,000 central air conditioning units exists among home owners in metropolitan areas throughout the nation—representing a $¼ billion market.

Philco Down on Hay Fever

Philco Corp announced recently that its lines of '57 air conditioners will generate negative ions for the relief of hay fever. The anti hay fever unit known as the "Ionitron," consists of a negative ion generator plus an efficient filter that reportedly will remove dust and pollen.

(*More Selling on page* 86)



PLP ARMOR-GRIP SUSPENSION UNITS — THE ULTIMATE IN CONDUCTOR PROTECTION

The PLP Armor-Grip Suspension Unit is an entirely new concept in transmission design. Unlike old style bolted clamps that exert concentrated clamping stresses, Preformed Armor-Grip Suspension Units cradle the conductor in neoprene. This protects the conductor, yet the Preformed AGSU Rod components firmly grip the conductor, distributing the tensile load throughout their length. With Preformed Armor-Grip Suspension Units there are no parts to loosen in vibration. Because of their smooth contour and large diameter, corona emission, radio influence and arc-over are minimized. These, plus easier installation, are some of the reasons why more Utilities are adopting this new type of suspension. Write for more information today.

Dept. No. PR1A

PX-79

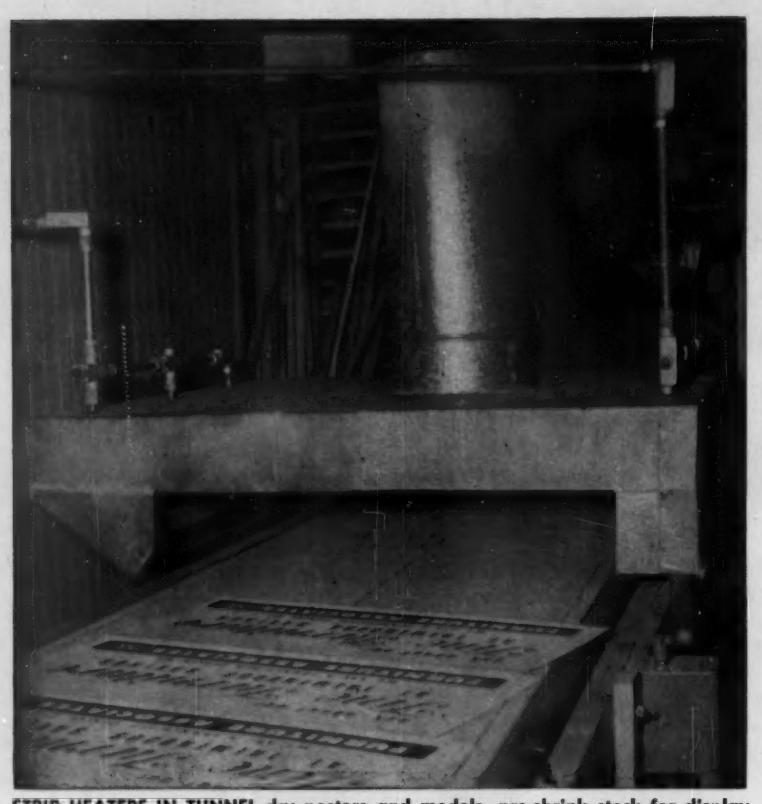
PLP Armor-Grip Suspension Units support these 132 KV Cleveland Electric Illuminating Company lines.

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

Telephone: Cleveland EXpress 1-3571

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending



STRIP HEATERS IN TUNNEL dry posters and models, pre-shrink stock for display maker. Hood fits over run-out area, cuts run-out time with forced-air cooling.

Infrared Saves Models from Rack

J. A. KRONER, Industrial Sales Engineer, Connecticut Light & Power Co, New Britain, Conn.

An infrared drier, teamed up with a conveyor belt, is saving space, cutting rejects, and reducing drying time at the Stifel and Kufta Display Co, New Britain, Conn., merchandising display manufacturer. The companies products range from posters to large complicated scale models of power plants. The conveyor carries the painted or silk-screened signs and displays through a sheet-metal tunnel which houses three, reflector-mounted, 1.8-kw far-infrared strip heaters.

With the new installation, drying racks have been eliminated. Rejects, caused by improper color register or by handling the displays before they were thoroughly dry, have been cut to a minimum. Drying time is down sharply.

The flexible installation can be used for drying a variety of paints and inks and for pre-shrinking paper stock to insure proper color register. Even enamel—normally a slow process for a low heat oven—can be dried sufficiently to permit stacking by using two passes.

Operated from a 208-v line, the oven has an input controller which can be adjusted to provide the right heat for each job. An 8-in. 1/5-hp centrifugal fan, mounted in the cooling hood, blows cool air over the run-out table to shorten run-out time.

Know of a successful application? Tell us who, where, how, type of load, benefits. $5 to $25 honorarium Industrial Editor, Electrical World, 330 W 42 St, New York 36, N. Y.

Automation Key . . .

to electrified material handling, Brown of GE tells 100th industrial forum

"Without well-planned material handling methods automation cannot be achieved." In making this statement, J. J. W. Brown, General Electric Co, was defining automation as "continuous automatic production."

Brown, who is manager of application engineering and materials handling, was one of the speakers at the 100th industrial forum conducted recently as part of GE's "More Power to America" program. The forum was held at Newark, N. J., with Public Service Electric & Gas Co as co-sponsor.

"Material handling is responsible for about 25% of the total cost of the product," the speaker said. "Measured in another way, material handling consumes almost 40% of the total labor cost. And yet these handling operations add not 1¢ to the value of the product."

Electrified materials handling will give you these benefits:

1. Conserve manpower.

2. Contribute to increased production.

3. Provide for better utilization of plant facilities.

4. Contribute to inventory control.

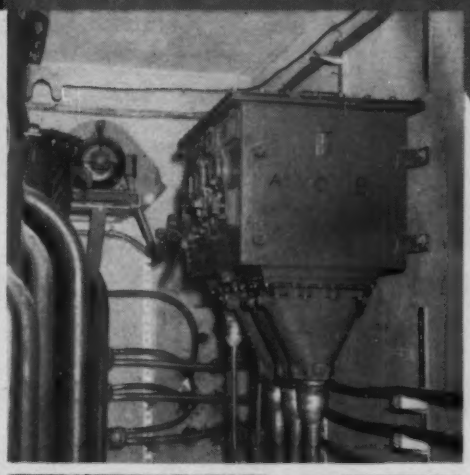
Brown advised that every movement of material in the plant operation (at receiving, between machines, at assembly, on the bench, in the stock rooms, at shipping, and even in the freight car) should be critically analyzed and placed in one of these three areas:

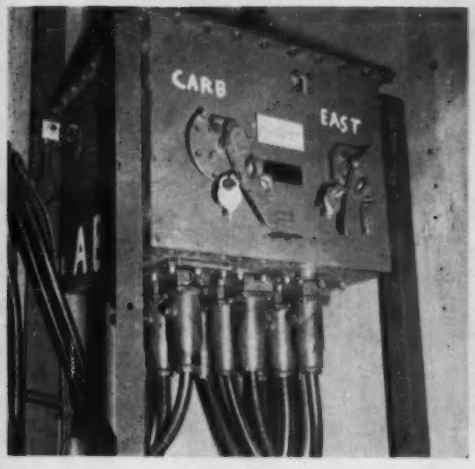
1. The manual area, which embraces hand operations and hand equipment.

2. The mechanization area, which includes trucks, conveyors, and transfers.

3. The automation are, in which material handling integrates with processing equipment.

After analysis it may be possible or economically sound to move some or all operations to a higher stage of development.





LOAD BREAK OIL SWITCHES

make cable systems f-l-e-x-i-b-l-e

G&W TYPE "RA" OIL SWITCHES provide safe, convenient and low cost means for sectionalizing distribution circuits. They have been used since 1928 by many electric utilities. They have a remarkable trouble-free operating record which fully justifies their use as load break disconnects for single and multiple circuits. They are simple in construction, installation and maintenance. They operate properly after long periods of inactivity to provide for isolation of cable sections in case of faults. They permit rapid re-routing of circuits to materially reduce losses incurred through electric service interruptions. They are made in many styles for 2 way to 6 way, cable or overhead connections, 400 ampere, voltages up to 34.5 Kv.

It will pay you to investigate the possibilities of Type "RA" oil switches for your distribution system. Send for Bulletin DB51 and call in our engineer representative.

G&W ELECTRIC SPECIALTY CO.
3500 W. 127th Street, Blue Island, Illinois

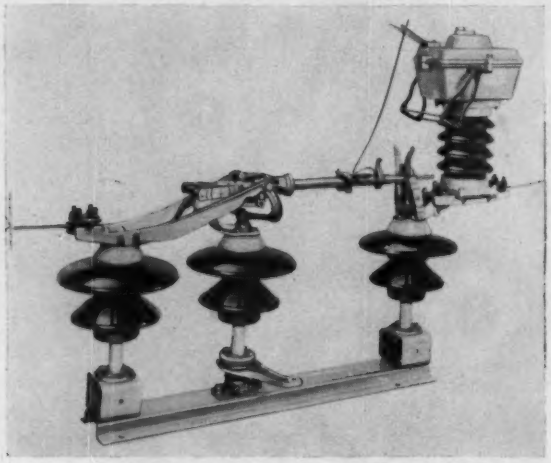
Canadian Mfrs.—Powerlite Devices, Ltd.
Toronto, Montreal and Vancouver

Representatives in principal cities of U.S.A.

D562

G&W

NEW EQUIPMENT



Oil Interrupter

This type PLL 600-amp oil interrupter can be mounted on new or existing vertical break air switches and is an accessory to type PV horizontal mounted switches rated at either 23 kv or 34.5 kv. It can interrupt or pick up load currents equal to the full, continuous current, 600-amp rating.

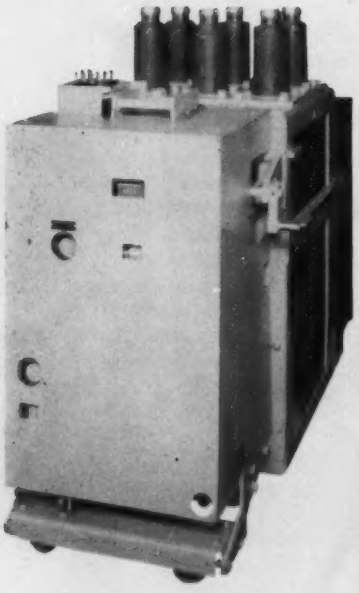
The unit consists of an oil-filled device housed in a porcelain insulator and a rod to shunt current through the interrupter while the main switch is being disconnected. The rising switch blade engages a trip lever which opens the contacts under oil at high speed. Manufacturer claims addition of interrupter to existing PV switches will not change electrical clearances, phase spacings or performance under adverse conditions.

Line Material Co, Milwaukee 1, Wis.

Digger Attachments

Three power feed attachments for diggers use the derrick weight and hydraulic power to feed digger into ground . . . Series 4407 Power Feed Linkage attaches to side legs of derrick; series 4411 and 4412 Bracket-types locate on middle leg. Can be used under low-lines or close to obstructions.

J. H. Holan Co, 4100 W 150 St, Cleveland 11, Ohio.



Breaker Operator

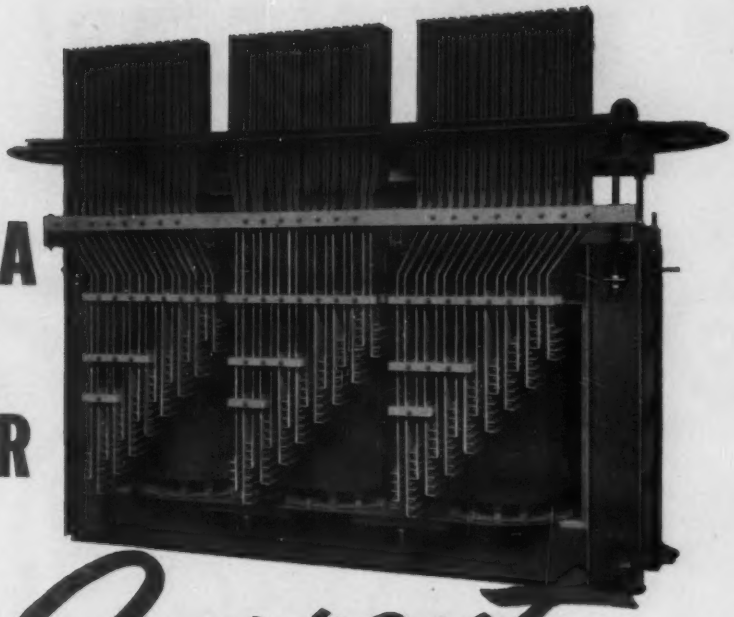
A new stored energy mechanism to operate magne-blast circuit breakers with metal-clad switchgear is available in voltage ratings of 4.16 to 13.8 kv, with interrupting ratings from 150 to 750 mva inclusive. The equipment receives its energy from a small operating motor and is said to be suitable for general applications on electric utility and industrial power systems.

Reported to eliminate need for relatively large operating battery or control power transformer and closing rectifiers, the mechanism is recommended for installations where it is desirable to limit the source of a-c or d-c closing power. The manufacturer claims mechanism surpasses industry life requirements of 10,000 operations when operating magne-blast breakers.

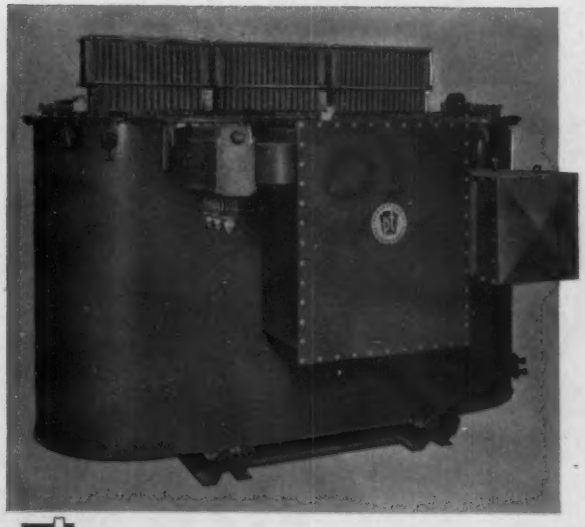
General Electric Co, Schenectady 5, N. Y.

(More New Equipment on page 90)

Does this PENNSYLVANIA FURNACE TRANSFORMER set a *High Current Record?*



Investigation seems to indicate that it does — but record or not, the 82,000-ampere low voltage line current for which the unit is designed definitely is one of the highest current ratings ever provided for a furnace transformer in this country.



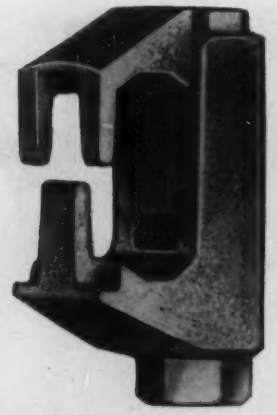
This extremely high current can be delivered at the future transformer rating of 21,300 kva. Now rated at 16,000 kva (with a maximum L.V. line current of 61,600 amperes), the three-phase unit has provisions for the addition of forced-oil cooling equipment to supplement the present water cooling and achieve the higher kva rating.

The transformer has a high voltage rating of 13,200 delta volts, and a low voltage rating of 250 delta volts with a full-capacity tap range in 10-volt steps down to 150 volts. The high L.V. line current results from the high kva and the fact that the lowest low voltage tap is at full capacity. The various low voltages are accomplished by means of a motor-operated, remote-controlled tap changer in the H.V. winding.

Pennsylvania now has designed and built furnace transformers ranging from 250 through 25,000 kva, and from 3175 through 82,000 amperes. Why not put this furnace transformer know-how and experience to work for you?

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** Greater Pittsburgh District



Vise Connector

These Vise Grip connectors, operating as a small vise, are available in ten sizes. Each is said to hold either two maximum size conductors or one maximum size and one smaller size, down to a minimum of No. 20 AWG. Each unit consists of a body, a slide, and a threaded, hex-head bolt which holds body and slide together. Tightening bolt forces slide toward body, creating a compression force on the two conductors.

Design is said to permit direct assembly to two conductors without slide rotating out body. Only two sizes of bolts are used for the ten connector sizes. Interlocking holding fingers are reported to provide self-support with bolt either up or down.

Penn Union Electric Corp, Erie, Pa.

Insulation Test Unit

A high voltage test set is designed for non-destructive tests of cable insulation. It is said to be suitable for either sample or full reel tank testing. Output voltage is adjustable from zero to 100 kv, the maximum steady state current 2 ma or 5 ma. Transformer, X-ray diode rectifiers, filters, and voltage divider metering circuit are enclosed in the oil tank. A gravity type shorting circuit automatically shorts the output to ground whenever power is removed.

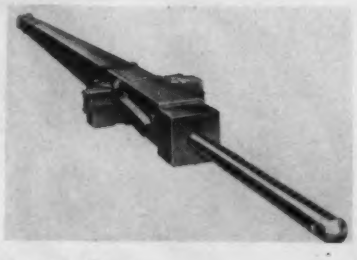
A kv meter and ammeter may be used to determine leakage reactance. Other features are an overcurrent relay to deenergize the high voltage and external interlock provisions.

Peschel Electronics Inc, 19 Garden St., New Rochelle, N. Y.

Wiring Raceway

A wiring raceway has been designed that the manufacturer claims permits quick wiring of electrical and electronic equipment with precut wires already equipped with solderless connectors. The new design uses slots rather than holes. Wires with terminals can be passed through the slots; slot arrangement is reportedly such as to allow wires to leave the raceway in the same plane as the destination terminal. Called "Panel Chanel", the raceways come in a range of sizes from 1 x 1 to 4 x 4 in.

Stahlin Brothers, Inc
336 Maple Street, Belding, Mich.



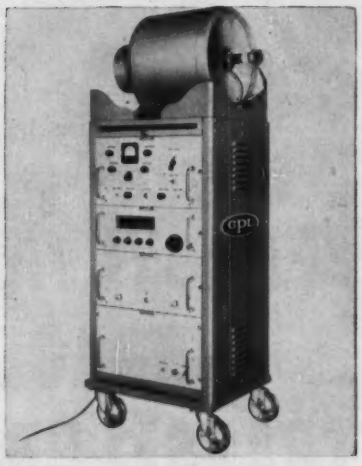
Soot Blower

Here is a retractable soot blower designed for very wide furnaces. Designated Vulcan T-30, it has been built for traverse travels greater than 36 ft. It is said to be suited for outdoor installations in northern climates, and can be used with either air or steam, with nozzle pressures from 50 to 425 psi. The T-30 uses two electric motors, one to extend and retract the lance, and the other to rotate it for a clean sweep of the tubes in all directions.

Copes-Vulcan Division, Blaw-Knox Co, Erie, Pa.

TV Projection System

This portable TV projection system, Model PB-611A, is designed for large audiences and is reported to have a minimum picture width of 6 ft, a maximum width of 16 ft. Manufacturer claims the projection is approximately four times as bright as his earlier models, with better clarity and detail. The 12-in. diam optical elements are said to have an aperture of 0.6. Picture



can be centered by tilting the barrel. The projection tube can be moved independently on any of three axes. **General Precision Laboratory, Pleasantville, N. Y.**

More New Products

Boston Woven Hose & Rubber Co, Boston 3, Mass., offers Bull Dog Premium Brown **friction tape,** said to have high tensile strength, superior aging and unravelling, and high dielectric strength.

R. E. Dietz, Dietz Bldg, Syracuse 1, N. Y. has a completely transistorized electronic **highway hazard flasher** in two-faced and 360-deg models. Lenses are yellow, flashing rate 60 to 70 times per minute.

Federal Pacific Electric Co, 50 Paris Street, Newark 1, N. J., offers a line of industrial double throw safety **switches** for 240-600-v ac.

Detroit Lectern Co, Inc, P. O. Box 3735, Detroit 15, Mich., has an Executive portable **folding lectern** for sales, training and public relations purposes.

L & R Mfg. Co, 577 Elm St, Arlington, N. J. has available Power Nofome instrument **cleaning solution** and L & R instrument **rinsing solution** for removing oil, grease and foreign matter from delicate and intricate metal parts. Flash point is said to be approximately 100F, TCC.

Give the GUY a CHANCE..

8 WAY EXPANDING ANCHORS

FOR "ALL 'ROUND" HOLDING POWER

It's not surprising that in every field test the Chance 8-Way Expanding Anchor holds more than its rated load because its design just makes common sense. Eight blades expand to form a pyramid shaped square—there is no wasted space between blades. The load is distributed evenly—all around the hole. It seems logical that it should hold more, and it does. That's why it's on so many company standards.

The 8-Way is usually installed in clay or loam. Available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying.

FIELD ASSISTANCE

Chance Regional Guying Specialists have the practical experience and technical know-how to demonstrate proper anchoring to your field personnel and make field tests to aid in anchor selection.

For Dependable Anchoring

A Check guy load and soil class

B Select the right anchor

C Install it properly

JACK CURTRIGHT*, "the Chance Anchor Man," stakes his reputation on . . .

the A B C's of Anchoring

Good anchoring is low cost insurance against line sag, leaning poles, storm damage, and other line construction failures.

The formula for good anchoring is as simple as A-B-C and just as basic . . . Check the guy load, determine the type of soil and what it will hold, select the *right* anchor for the soil and guying condition, and install it properly. Chance engineers have made this an easy formula to follow by designing an anchor for every guying condition.

In tests by anchor users, Chance Anchors almost always take top position for holding power and for ease of installation in their specific applications.

Always Be Confident

Always Buy CHANCE

*Chance Anchor Sales Manager

Serving the Utility Industries since 1907

50 YEARS ANNIVERSARY

Give the GUY a CHANCE... there's a CHA

8 WAY EXPANDING ANCHORS

FOR "ALL 'ROUND" HOLDING POWER

It's not surprising that in every field test the Chance 8-Way Expanding Anchor holds more than its rated load because its design just makes common sense. Eight blades expand to form a pyramid shaped square—there is no wasted space between blades. The load is distributed evenly—all around the hole. It seems logical that it should hold more, and it does. That's why it's on so many company standards.

The 8-Way is usually installed in clay or loam. Available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying.

FIELD ASSISTANCE

Chance Regional Guying Specialists have the practical experience and technical know-how to demonstrate proper anchoring to your field personnel and make field tests to aid in anchor selection.

NEVER-CREEP

Reinforced structural steel. Pulls ent
solid, undisturbed earth. For extra
in clay or loam.

CROSS-PLATE

For heavy-duty anchoring in machine-bored holes. Holds better than logs or slugs. Saves time and money.

EXPANDING ROCK

No grouting necessary. The greater the pull, the tighter it wedges against solid rock. Set in 2" drilled hole.

Your Chance A

Her
Reso
Yo

MIKE THE MOLE says:

Here is the most complete guide to better anchoring ever developed. It's chock full of how-to-do-it material to help you select the right anchor for every guying job—and install it properly. It's FREE!

aid in anchor selection.

since 1907

ANCE ANCHOR for every guying need

P

ulls entirely against
extra heavy loads

NO-WRENCH SCREW

For hand or machine installation. Pitch-controlled blade goes down faster and adds to holding power in sandy soil, soft clay or loam.

chine-
gs or

SWAMP SCREW

For swamps, marshes, quicksand, river crossings or seasonally flooded areas. Screws down deeply by adding sections of pipe.

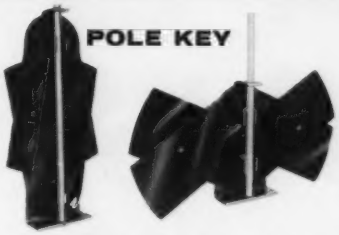
8-WAY CONE

Acts as inverted wedge. Flaring base and flat faces increase wedging action. Used in rocky areas with rock wedging.

er the
t solid

WRENCH TYPE SCREW

All steel—double arc welded. Anchor hub absorbs installation strain. For light loads in sandy soil, soft clay or loam.



POLE KEY

Keys poles at the butt to reinforce them against unbalanced loads in soft soil. Ideal for congested urban areas.

nce Anchor Distributor can supply you from stock. Specify Chance for Service!

CA57-1

A. B. CHANCE CO.

Centralia, Missouri

O.K. Have "Mike" send us ____ copies of "ANCHORING"

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____

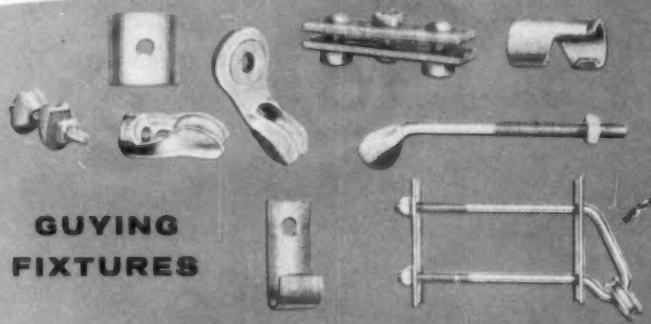
STATE _____

aid in anchor selection.

job—and install it properly. It's FREE!

CHANCE Guying Equipment

for the BEST in guying



GUYING FIXTURES

For neatness, efficiency and economy nothing equals Chance Guy Fixtures on the pole. They save the wrap-around strand, and the full-rounded Thimbleye gives complete strand protection during slack pulling operations and when in use. Chance fixtures are drop forged from high grade steel—heavily galvanized. The line includes everything for the guy.

CHANCE GUY GUARDS

EASY INSTALLATION

HIGH VISIBILITY

LONG LIFE

MONO-BOLT GUY GUARD

TAPERED GUY GUARD

Chance Mono-bolt Guy Guards are easy to install. No stretching for high bolts—the single, easily accessible bolt is at the bottom of the guard. Mono-bolt Guards come in half or full round construction, in 7 or 8 foot lengths.

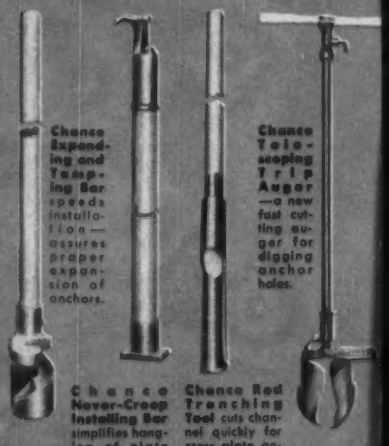
Chance Tapered Guy Guards fit over all kinds of guy clamps—even large U-bolt types. Full round construction, 8 foot lengths.

These guards fit any size rod from ½" to 1¼" and are made of hot galvanized steel for long life and high visibility.

GUY RODS

There is a difference in anchor rods—in the shape of the eye and in the galvanized protection. The full rounded Thimbleye design, an A. B. Chance Company development, protects the cable from strain at any angle of pull, prevents binding and aids slack pulling. You get the same protective contour in Thimbleye, Twineye, or Tripleye Chance rods, Threaded or Never-Creep types.

CHANCE TOOLS for faster installation



Chance Expanding and Tamping Bar speeds installation—assures proper expansion of anchors.

Chance Never-Creep Installing Bar simplifies hanging of plate anchors on rod.

Chance Rod Trenching Tool cuts channel quickly for cross plate anchor rod.

Chance Telescoping Trip Auger—a new fast cutting auger for digging anchor holes.

ABC INDUSTRIES

A·B·CHANCE CO·

STATE _____

A PRIME OUTLET FOR GOOD PUBLIC RELATIONS

and a desperately-needed public service

One of the most effective public relations jobs ever accomplished was achieved last year by hundreds of companies and individual businesses of every size.

These companies have been helping to sustain an advertising campaign that performs a desperately-needed public service: It shows the American people how to drive to stay alive. It also portrays the almost unbelievable fact that more than 40,000 men, women and children were killed in traffic accidents last year—and tells what to do to help stop highway homicide.

The campaign was prepared by a volunteer advertising agency in cooperation with The Advertising Council and The National Safety Council. But the over ten million dollars worth of time and space which carry the messages to the public was contributed by media owners or sponsored by business organizations, in the public interest.

Your own plans may readily permit the inclusion of such advertising—both from the view of the vital public service it would perform, and the incalculable good will it would promote for your name, your company, and your product or service.

To find out how easily your own program can tie in with this nationwide effort, and for the complete story on who, what, when and where, we sincerely invite you to write to The National Safety Council, Chicago 11, Illinois.

Published in cooperation with
The National Safety Council
The Advertising Council

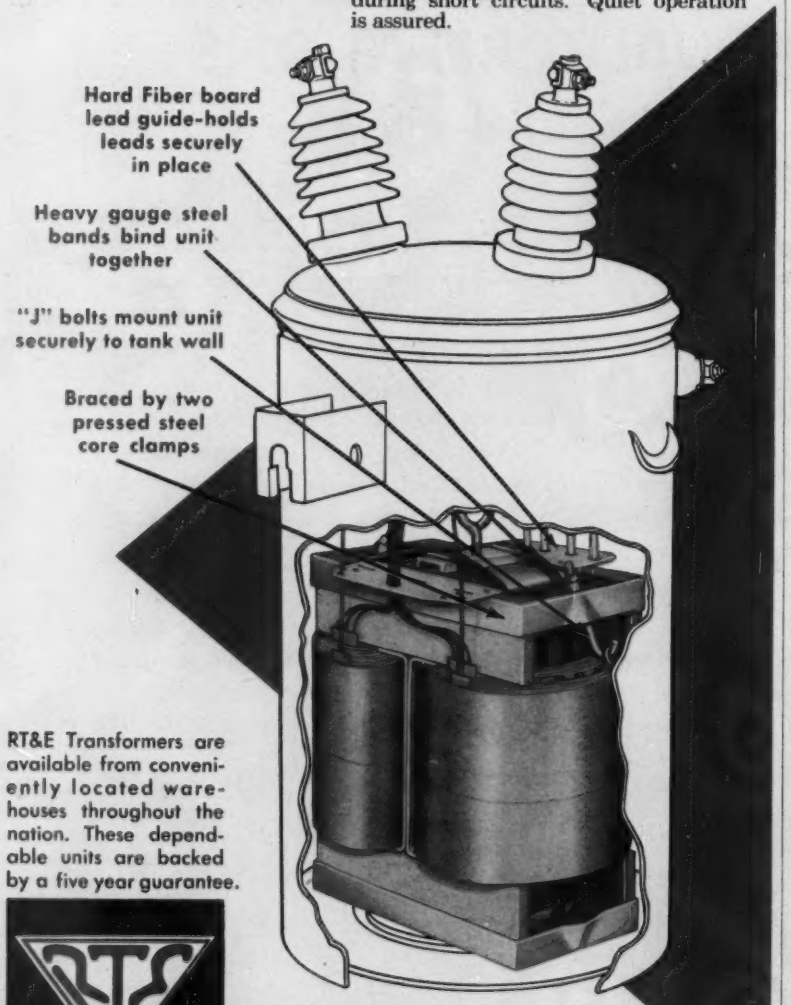
H·B·CHANCE CO.

What Makes RT&E Transformers Better?

RUGGED CORE-COIL CONSTRUCTION
Insures longer, more reliable transformer life.

Maximum mechanical strength of Core-Coil unit is obtained by RT&E's unique core-coil clamping method. This eliminates the conventional vertical clamp members by utilizing the tank for this purpose.

A rigid, unitized construction is thereby attained. This maintains all parts firmly fixed with relation to each other—additional coil surface is exposed to the cooling oil, and additional strength is gained for bracing the coil against distortion during short circuits. Quiet operation is assured.


Hard Fiber board lead guide-holds leads securely in place
Heavy gauge steel bands bind unit together
"J" bolts mount unit securely to tank wall
Braced by two pressed steel core clamps

RT&E Transformers are available from conveniently located warehouses throughout the nation. These dependable units are backed by a five year guarantee.

RT&E CORPORATION
WAUKESHA, WISCONSIN

RUGGED CORE-COIL CONSTRUCTION — *Another reason why* RT&E *is better!*

CATALOGS—BULLETINS

• **COMBUSTION ANALYZER:** Specification E65-5 describes the "Heat Prover" combustion analyzer for exhaust gases from boilers and industrial furnaces made by Bailey Meter Co, 1050 Ivanhoe Road, Cleveland 10, Ohio.

• **MISCELLANEOUS:** The following publications have been issued by Minneapolis-Honeywell Regulator Co, Industrial Division, Philadelphia 44, Pa.:

System Load and Frequency Control Bulletin, No. B91-1, describes all-electronic load and frequency control systems for captive plant, small utilities, and multiple station applications.

Input transformers for many low-level ac and dc servo, measuring and coupling circuits are covered in Specification S900-1.

Brown Low Level Period Amplifier for nuclear reactor start-up is described and illustrated in Specification S901-5.

• **VOLTAGE REGULATORS:** Construction and operating features of "Rocking Contact" voltage regulators (Type A, B, and C) for ac current generators rated to 25,000 kva are described in bulletin 14B6035C published by Allis-Chalmers Mfg Co, 932 S. 79th Street, Milwaukee, Wis.

• **TRUCK COSTS:** Utilities, manufacturers and others operating truck fleets may be interested in the 35th annual Edition of White-Autocar "Cost Record Book", which provides a simple comprehensive system of analyzing truck operating costs. Can be tailored to any truck-using business and any size fleet. Sample copy may be obtained by writing White Motor Co, Cleveland 1, Ohio.

• **COILS:** An 8-page illustrated bulletin describing its facilities and line of industrial coils has been issued by Stonite Coil Co, Route 25, Yardville, N. J.

• **AIR COMPRESSORS:** A consolidated data sheets listing all models with specifications of Brunner air compressors, ½ through 20 hp, is available from Brunner Mfg Co, Utica, N. Y.

• **OVER-TEMPERATURE THERMOSTAT:** A direct-acting control that is said to protect equipment from exceeding pre-selected temperature limits is described in bulletin RT-809. The control described, Model H2, is available in temperature ranges to 800 F. Write Robertshaw-Fulton Controls Co, 110 E. Otterman Street, Greensburg, Pa.

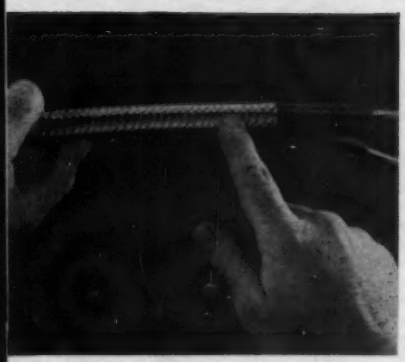
• **INDUSTRIAL TELEVISION:** An 8-page brochure covering its line of industrial television equipment, including cameras, monitors, controls, lenses, and other accessories, has been issued by Philco Corp, Government & Industrial Div, 4700 Wissahickon Ave, Philadelphia, Pa.

• **WIRE MARKERS:** A 1-page flyer illustrates and describes a wire marking system using plastic tubes developed and manufactured by E.C.P. Corp, 6808 Wade Park Ave, Cleveland 3, Ohio.

• **HORIZONTAL PRESSURE FILTERS:** Publication No. 6322 furnished details on the Horizontal pressure filters for industrial and commercial use made by Cochrane Corp, 17th Street below Allegheny Ave, Philadelphia 32, Pa.

Continuous cable run from pole to meter is provided by Kansas City Power & Light Co. with Type K service drop.

utility man ~~Woodman:~~ spare that tree— with Anaconda aluminum-sheathed service drop



Anaconda Type K Service Drop features two insulated aluminum conductors and a flat bare aluminum neutral. Tough aluminum ribbon covering over neoprene-insulated conductors reduces outages caused by foreign objects.

Unique Type K cable minimizes tree problems, contact hazard, power theft.

Installing service drop through trees is just asking for outages from chafing action of tree limbs. Trim the tree and you face an outraged owner. Besides, it's costly.

The ideal answer is Anaconda Type K service drop.

"In general this cable is self clearing in trees because of the sawing action of the bare neutral," reports Kansas City Power & Light Co., who has been a user of Type K for many years.

"In addition, Type K service drop:

1. *Reduces threat of power theft.*
2. *Eliminates contact hazard to employees and the public.*
3. *Is more convenient to install and operate, especially through trees.*
4. *Eliminates abrasion of insulation, power loss, and interruptions of service because of burndowns.*
5. *Is more attractive."*

Type K cable is light, flexible, easy to install in unbroken runs from pole to meter. Standard accessories are used. Specially compounded insulation gives excellent electrical properties.

Ask the Man from Anaconda or your Anaconda distributor for full information today. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. B7431

Ask the Man from **ANACONDA®**
for **ALUMINUM WIRE AND CABLE**

TOPS THEM ALL
for low cost overhead installations!

COLLYER
Copper or Aluminum neutral-supported

SERVICE CABLE!

EASY TO INSTALL . . . Bare messenger supports the full cable load . . . leaves insulated power conductors free of tension for fast, easy tapping and splicing

ECONOMICAL TO MAINTAIN . . . Tough, neoprene insulation or polyethylene insulation provide maximum protection against abrasion, flame, sunlight and ice . . . assure years of trouble-free service.

READILY ADAPTABLE . . . Collyer Neutral-Supported Service Cable may be easily adapted for multiple street light wiring (2 wire), secondary runs (3 wire), or commercial services (4 wire). Copperweld messengers are available for additional strength and longer spans.

Write today for further information

Collyer

LIVE BETTER ELECTRICALLY

INSULATED WIRE CO.
245 Roosevelt Avenue,
Pawtucket, R. I.

TECHNICAL LITERATURE

TEXTILE MATERIALS — The latest ASTM tentative and standard methods of tests, specifications and definitions pertaining to textile materials are included in "ASTM Standards on Textile Materials". Although much of the work information lies outside the interest of Electrical World's readers, there is still much of interest on the electrical properties of the asbestos and synthetic materials. $6.25 a copy. Write American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

MECHANICAL SPRING DESIGN — A guide for the product engineer faced with the problem of designing a specific spring is the revised edition of "Handbook of Mechanical Spring Design", recently published by Associated Spring Corp. This 84-page manual contains most of the information the engineer must have in the preliminary design stages of spring projects; fundamental formulae for stress and deflection of every type of spring; a compilation of the physical and mechanical properties of the most frequently used spring materials; practical considerations of spring design; and commercial tolerances for compression; extension and torsion springs which can be held under the usual methods of production. Free to engineers and executives of spring-using companies who request it on company letterhead. Write Associated Spring Corp, Bristol, Conn.

CORROSION & HIGH-TEMPERATURE SERVICES—Engineers and others involved in the problems of corrosion and high-temperature services will be interested in the technical data in ASL No. 285 and ASL No. 286, two publications of the Tubular Products Division of Babcox & Wilcox. ASL No. 285 offers data on B & W Croloy 27-4-1 (Type 329) in tubular form, and ASL No. 286 furnishes the same information on B&W Croloy 25-12 (Type 309S). Free, address Babcox & Wilcox Co, Tubular Products Div, Beaver Falls, Pa.

THIN ELECTRICAL STEEL PROPERTIES—A 56-page manual from Armco Steel Corp gives designers of electrical equipment test results on 3 types and 5 thicknesses of thin electrical steel. Booklet covers applications, specific uses, methods of application, fabrication, mechanical and physical properties, magnetic properties, testing methods and conversion factors. No charge. Write Armco Steel Corp, Product Information Service, Middletown, Ohio. Ask for publication No. P.O.4856.

TRANSISTORS—GE has published a booklet entitled "Transistor Manual" containing basic information on transistors and their operation in circuits. Intended to meet the needs of the design engineer and service technician, it includes information on basic semiconductor theory, construction techniques used to make the various types of transistors now on the market, principles of transistor circuit design, and specifications with outline drawings of all transistors registered with Radio-Electronic-Television Manufacturers Assn. Transistor parameter symbols now in common use are also included. Price is 50¢. Write Semiconductor Products Dept, General Electric Co, Syracuse, N. Y., or local GE tube and transistor distributors.

All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.

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CLEVELAND 11, OHIO

SERVING UTILITIES IN CANADA

BRANTFORD HOLAN LIMITED

BRANTFORD, ONTARIO, CANADA
BRANCHES COAST TO COAST

fast field service wherever you are

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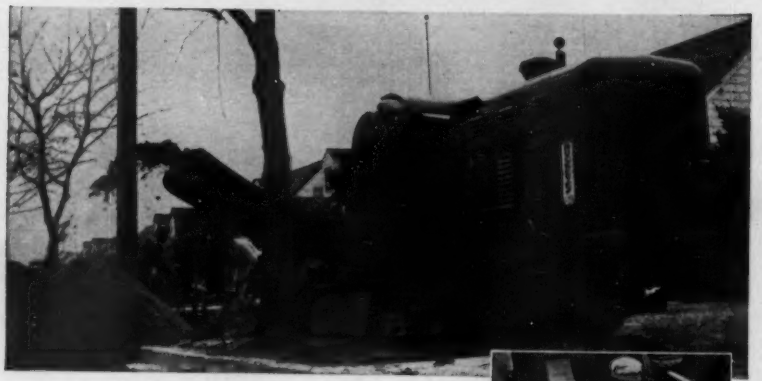
302 EAST PIMA STREET • PHOENIX, ARIZONA

SERVING UTILITIES IN THE SOUTHERN STATES

HOLAN CORPORATION of GEORGIA

EVEREE INN ROAD • GRIFFIN, GEORGIA

Push-Button Conveyor Shift Speeds Ditching with the 407



To clear obstructions, just push a button... conveyor shifts while you keep digging!

Instant conveyor shifting by push-button control is a big Gar Wood-Buckeye Model 407 advantage for utility work. It means faster, easier nonstop work in close quarters and around obstructions. Only Gar Wood-Buckeye has it!

And, only Gar Wood-Buckeye gives you these other important operating advantages: Speeds you can find and use . . . one selector lever plus high-low range lever makes changing speeds easy. Independent lever steering that is positive and reliable. Instant control of live hydraulic boom with positive down-pressure.

In every way, the 407 is far easier to operate, control and adjust than any other ditcher in its class. No wonder it has become the standard for utility work, as well as the world's largest selling ladder-type ditcher! See your Gar Wood-Buckeye dealer, or write direct to: Customer Service Department, Gar Wood Industries, Inc., Wayne, Michigan.

GAR WOOD INDUSTRIES, INC.

Wayne, Michigan, • Findlay, Ohio

BOOKS

Received Since January 11

Patent Notes For Engineers. By C. D. Tuska. Published by McGraw-Hill Book Co, Inc., 330 W. 42nd St., New York 36, N. Y. 192 pages, illustrated. Price $4.00.

The Cathode Ray Oscilloscope. By J. Czech. Published by Philips Technical Library, Distributed by Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. 340 pages, illustrated. Price $8.50.

Basic Electrical Engineering. By A. E. Fitzgerald and David E. Higginbotham. Published by McGraw-Hill Book Co, Inc., 330 W. 42nd St., New York 36, N. Y. 540 pages, illustrated. Price $7.50.

Why Structures Fail

Engineering Structural Failures. By Rolt Hammond. Published by Philosophical Library, Inc, 15 E. 40th St, New York 16, N. Y. 224 pages, illustrated. Price, $12.00.

This book provides a useful survey of the causes and results of more than a century of failures in dams, earthworks, tunnels, buildings, and other major structures.

The author exposes errors of judgment in design and execution and discusses each failure fully to evaluate site conditions and to foresee consequences. He points out the lessons of these failures and emphasizes the importance of scale-model and full-scale research on structural problems.

This well-illustrated book is packed with information written in a concise interesting style. It would be a valuable addition to the library of an engineer associated with design or construction of dams, plants, or other large utility structures.

Introducing Electricity

Introduction to Electrical Engineering. By George V. Mueller. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St, New York 36, N. Y. 466 pages, illustrated. Price, $7.50.

Fundamental principles of electric and magnetic circuits and fields are presented in this third edition of an introductory text. It covers fundamental ideas, Ohm's and Kirchoff's laws, conductors and insulators, nonlinear-resistance circuits, electronics, magnetic circuits, electromotive forces, dielectric circuits, magnetic and electric fields, and electrochemistry.

Network theorems and electronics are treated more extensively in this edition, which contains many illustrations, examples, and problems. Because of its broad scope, this text would be useful to an engineer as a review or reference book and to a utility as a text for employees with high school education.

"I'll never replace
VICTOR SUSPENSIONS...
I just won't live that long!"

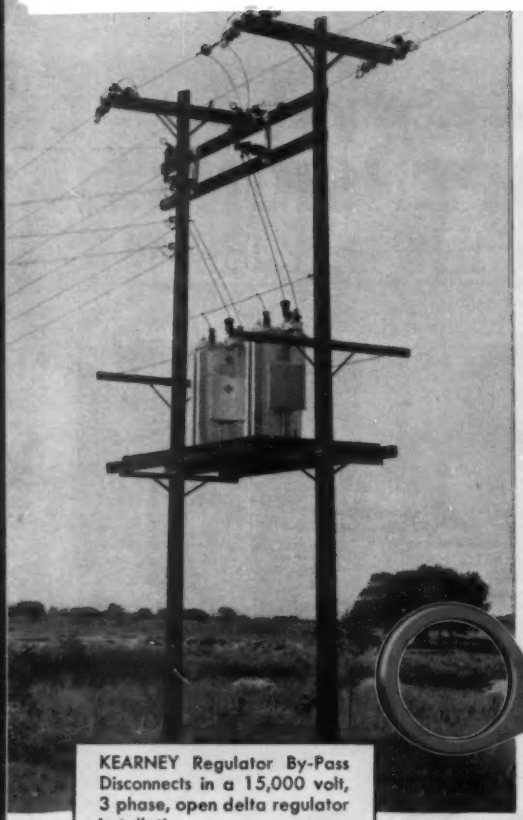
Men who purchase insulators are enthusiastic about the service records of VICTOR Suspensions. That's because VICTOR Suspensions are laboratory designed, manufactured under rigid quality controls and tested with the industry's most modern equipment.

Take the No. 900 Insulator shown above, for example. It has rugged, rounded corrugations for maximum strength and resistance to impact. Cap and ball bolt are thick, husky and galvanized to withstand severe service. Scientifically fitted glaze gives added strength and added protection against contamination. Each insulator is proof-tested mechanically, then subjected to vigorous high frequency and 60-cycle flashover tests. When you buy VICTOR, you just can't buy better suspensions!

New . . . . . .
VICTOR CATALOG

Now ready for distribution is Victor's newest and most extensive catalog. One of the most complete in the field, it includes illustrations and data on many items being produced at VICTOR and not previously shown, up-to-date EEI-NEMA Standards, and an outline of VICTOR'S new plant, research, testing and manufacturing facilities. It's FREE! Write for *your* copy.

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO., INC.
VICTOR, N. Y.



KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

Safe performance

of 4 operations in proper sequence assured by KEARNEY *REGULATOR BY-PASS* DISCONNECT

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

JAMES R. KEARNEY CORPORATION, *General Offices:* 4224-42 Clayton Avenue, St. Louis 10, Missouri

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

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The Mark of Quality

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA

ELECTRICAL BUSINESS OUTLOOK

Electrical World
FEBRUARY 25, 1957

Which direction prices? Wholesale price indexes are still pointing up. The Bureau of Labor Statistics index of industrial prices in January stood at 125.2. In January 1956, the figure was 120.4. It closed out last year at 124.7. But right now it looks as though the upward push in 1957 will be a lot less than it was last year.

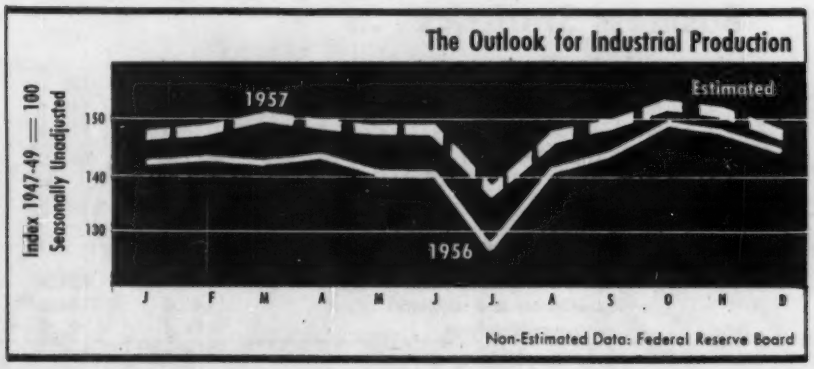
The papers are full of announced increases, and many of these will show up in the indexes over the next few months. Refiners raised prices of crude petroleum in mid-January. Steel manufacturers are asking higher prices for certain special types of structurals. Rail freight rates are up. And the coal industry is expected to seek a general price increase in April (EW, Feb. 18, p 159).

But, overall, the prices of basic raw materials are leveling out—in some cases they're dropping. Copper prices dipped from 36¢ to 32¢ during the first few weeks of February. Rubber prices are off about 7%, and steel scrap dropped off slightly.

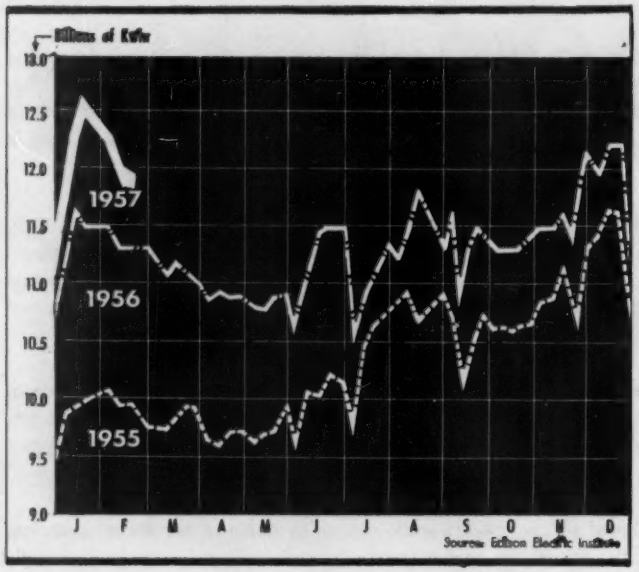
Dip in basic material prices reflects some easing in demand for these materials in contrast with the shortages of last year. Lower prices for basic materials will help ease the cost pinch. But manufacturers will hold the line on finished goods. For one thing increasing labor costs will in part cancel out the drop in material prices. And businessmen are anxious to restore profit margins that took a beating last year. Nevertheless, some of the intense pressures to boost prices of manufactures goods are blowing off.

Electrical equipment manufacturers have felt price increases more than most. Their price indexes since 1951 have lagged in comparison to those for its three major cost factors—labor, non-ferrous metals, and steel. At the end of 1956 the electrical machinery and equipment makers' index stood at 137 (1947-49 = 100), or from nine to 20 points under the others. Meanwhile other manufacturing industries—construction, metal working, and general purpose machinery and equipment—climbed in about the same proportions above the electrical machinery and equipment industry on the Bureau of Labor Statistics scale.

This portends more price hikes for electrical equipment. According to one large manufacturer's observations, the electrical industry would be justified in further price increases in view of rising costs. This is buttressed by the fact that other industries have already found it necessary to do so. (For additional views of pricing, see page 48.)



STATISTICS



OUTPUT

Week ended Feb. 16, 11,946,000,000 Kwhr Up 5.5%

Per Cent Change From Previous Year

	Feb. 2	Feb. 9	Feb. 16
Total U. S.	+ 6.8	+ 6.0	+ 5.5
New Eng.	+ 4.3	+ 5.3	+ 5.9
Mid. Atlan.	+ 4.5	+ 4.7	+ 5.2
Cent. Ind.	+ 6.0	+ 5.8	+ 5.9
West Cent.	+ 9.9	+10.0	+ 7.5
Southeast	+ 4.8	+ 4.5	+ 6.7
South Cent.	+11.6	+13.3	+11.3
Rocky Mount.	+10.3	+ 6.1	+ 5.8
Pacific			
NW	+ 9.2	− 2.5	− 6.4
SW	+11.1	+11.6	+ 5.0

Seasonally Adjusted Index 226.7
Week Ago 226.7
Year Ago 214.6

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 5.9%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Nov.	119.91	119.38	113.55	5.6
Peak—Class 1 Systems	Nov.	101.2	96.6	96.5	4.9
Estimated Dec. '56 Peak	Nov.	106.2	106.2	104.5	1.6
Estimated Dec. '57 Peak	Nov.	114.8	114.8	111.6	2.9
Production—billion kwhr	Nov.	50.65	51.13	47.78	6.0
Hydro		9.31	9.24	9.24	0.8
Fuel		41.34	41.89	38.54	7.3
Sales—billion kwhr	Nov.	45.78	45.98	42.96	6.6
Residential		11.66	11.27	10.74	8.6
Commercial		7.20	7.37	6.61	8.9
Industrial		24.51	24.79	23.28	5.3
Other		2.41	2.56	2.33	3.4
Fuel Consumption	Nov.				
Coal—million tons		14.03	13.52	13.31	5.4
Oil—million barrels		7.13	6.27	7.11	0.3
Gas—million cu ft		88.73	114.36	81.75	8.5
Net Income Class A & B Co's—$ million	Nov.	102.54	95.79	102.79	−0.2
Residential Customers—millions	12 mos.	45.62	45.49	44.30	3.0
Revenue per kwhr	ended	2.60¢	2.60¢	2.65¢	−1.9
Avg kwhr per customer	Nov. 30	2,956	2,942	2,728	8.4
Avg annual bill		$76.86	$76.49	$72.29	6.3

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Dec.	144	147	142	1.4
ENR Construction Cost	Feb.	148.9	148.4	142.6	4.4
BLS Cost-of-living	Dec.	118.0	117.8	114.7	2.9
New Orders for Machinery (1950 = 100)	Dec.	135	139	151	−10.6
NEMA Sales					
Insulation materials	Dec.	139	149	160	−13.1
Electric appliances		84	81	101	−16.8
Wholesale prices	Nov.				
Motors and generators		140.1	136.9	127.0	10.3
Transformers and regulators		146.6	144.8	129.2	13.5
Switchgear and fuses		164.4	161.9	145.9	12.7
GNP—annual rate—$ billion	3rd Qtr.	413.8	408.3	396.8	4.3

MANAGEMENT BULLETIN

FINANCE

The number of security offerings by electric companies picked up momentum last week. After a few weeks of doldrums, the market received three issues totaling nearly $50 million in new security offerings. Leading the way was the Halsey, Stuart & Co group winning $10 million New England Power Co first mtge 4⅜% bonds (Aa) due 1987 with a bid of 101.209%; reoffers at 102% to yield 4.255% . . . Blyth & Co group wins $37.5 million Southern California Edison first and refunding mtge series H 4¼% bonds due 1982 with a bid of 99.309%; reoffers at 100% to yield 4¼% . . . Paine, Webber, Jackson & Curtis is offering $1,750,000 Central Electric & Gas convertible subordinated 4⅞% debentures due 1971 at 100% to yield 5%.

An amendment to rules to provide for treatment of deferred taxes on income by electric utilities has been proposed by the Federal Power Commission. It also plans to amend annual reporting procedure to conform to the proposed amendments to the Uniform System of Accounts. Comments have been asked for by the FPC by April 1.

Crisp County Ga., Power Commission is making its final payment of about $75,000 on its bonded indebtedness of $1,250,000 which was voted in 1930 for the construction of a dam across the Flint River creating Lake Blackshear and the erection of a hydro plant at the dam.

Dayton Power & Light Co is offering 328,630 common shares to its stockholders on a 1-for-8 basis, record Feb. 8, expires Feb. 28 at $42 a share.

Subscription books have been closed on the $30 million offering of Potomac Electric Power Co, Kidder, Peabody & Co group has announced.

Louisville Gas & Electric Co reports 98½% of its 330,000 share offerings to commonholders were subscribed for at $23.50 a share. Balance was taken by the underwriters, Blyth & Co and Lehman Brothers.

More common stock dividends are announced. Houston Lighting & Power Co will pay June 10 a quarterly common stock dividend of 40¢ a share as compared with 35¢ a share in the previous quarter . . . Iowa Power & Light Co will pay April 1 a dividend of 40¢ a share versus 35¢ previously.

Electric co-ops plan to spend $967 million during the five-year period beginning July 1, 1957 for construction, U. S. Department of Agriculture has announced in its third annual survey. Co-op loan applications to REA will approximate $676 million to take care of this construction.

RATES

Companies are beginning to ask for rate increases. Public Service Co of New Hampshire has asked the PSC for about $600,000 a year . . . Pacific Gas & Electric Co has filed for a 5.94% increase, or about $17.4 million a year, with the California PUC.

LEGISLATION

Ohio Municipal League plans utility fight. To hold back rising electric and gas rates, the league will come to blows with utilities on three legislative fronts. The first will be the natural gas bill in Congress. The second will be a bill to change the present utility law in Ohio. And the third will be to halt any bill which would take money out of highway funds to reimburse utility companies for the cost of moving their poles, lines, etc.

Rural electric co-operatives in Arkansas are planning to amend a House bill aimed at freezing the division of territory between co-ops and private power companies.

A bill granting rural electric cooperatives tax relief from the Wyoming ad valorem

tax has been signed by Gov Milward L. Simpson. Co-ops will be taxed on a "revenue per mile" basis rather than the straight property tax charge under the bill.

A bill which would have prohibited public utilities from wholesaling or retailing gas and electric appliances has been killed by the Wyoming House.

Elimination of the tax-exempt status of the Salt River Valley Power District and other Arizona electric districts has been proposed in the Arizona legislature recently.

INDUSTRIAL RELATIONS

Problems of preparing supervisors today for tomorrow are up to every member of management, Walter Lucking, president, Arizona Public Service Co, said recently. He raises these points:

- How can we do a better job of supervisory selection with emphasis on the ability and the inclination of the individual to work through and with other people?
- How can we do more toward giving the supervisor a bigger part in solving management problems and making decisions?
- How can we help the supervisor draw up a clearer definition of his job as distinct from those above and below so that he can more accurately measure his effectiveness and develop more fully toward his goals?
- How can we improve our skill in coaching and developing each supervisor and providing a climate in which he can do his best work?
- How can we set up patterns of communications that will enable the supervisor to act with greater confidence and understanding?
- How can we fix accountability commensurate with a supervisor's responsibility and authority?

These points are broad and won't be answered by any single approach. Individual development of each supervisor in his own job situation probably is one of the best approaches, Lucking said.

"What Engineers Expect from Management" article by H. L. Rusch and J. R. Goeke, associate members of American Institute of Electric Engineers, appearing in the January issue of AIEE publication, reveals results of interviews with more than 800 engineers in some of the larger American corporations. Of those interviewed, 69% said that engineering as a career is more attractive than 10 or 15 years ago. About their jobs, 77% said that engineers are given too much routine work; 76% said that pay is not high enough compared with other positions requiring same or less ability; 61% said that engineers are not kept properly informed of company policy; 45% said too little chance to use creative abilities, and 44% said that the company does not help to further his education. Job that the engineer likes the most is "interesting work."

AREA DEVELOPMENT

Because the St. Lawrence Seaway will have an effect on American industry the Cleveland Seaway Committee of the Cleveland Chamber of Commerce is mailing out a booklet entitled "Port of Cleveland." It "inventories" facilities available for overseas shipment of bulk and package freight. For copy, write, Robert M. Atkins, general supervisor Area Development Department, Cleveland 1, Ohio.

MISCELLANY

Arizona Public Service Co installs a Univac at its Phoenix office. By manipulation of controls and introduction of various materials on tapes and punch cards, operators have developed a number of stunts with the machine. They even make the machine sing several songs—one composed by a company employee is the "Reddy Kilowatt Polka."

No Storage Problem Here!

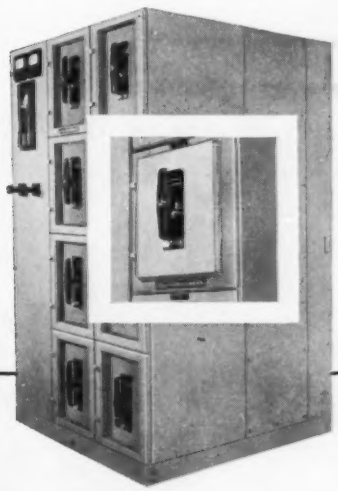
Only Allis-Chalmers low voltage switchgear permits convenient storing of breaker in its own compartment with door closed!

To give space needed when breaker is in disconnected position, center panel is reversed by simply loosening four knurled nuts. No tools are needed.

A specially contoured reversible center panel in each compartment door does the trick. When breaker is in test or completely disconnected position, the center panel may be reversed to extend outward from the surface of the unit . . . gives additional space inside cubicle.

This means no special storage space is required for breakers not in use. Handling and danger of damage during movement of breakers are eliminated.

As long as breaker is in compartment it is always firmly fastened to withdrawal mechanism and can't make contact accidentally.



Get the complete story!

There are many other desirable features in Allis-Chalmers low voltage switchgear. For details call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-5169

the BIG, strong,

You can barely hear these

whispering 4000-hp Allis-Chalmers 2-pole motors

driving boiler-feed pumps at Detroit Edison's River Rouge Plant

Kilowatt output at River Rouge is at a record high — yet things are pretty quiet — especially in the neighborhood of these big 4000-hp, 4000-volt, 3580-rpm Allis-Chalmers motors. Gone is the irritating whine of high speed motor operation — these boiler-feed pump drives just whisper while they work.

Practically all of the mechanical noise has been engineered out by Allis-Chalmers. Special design of the rotor has eliminated much of the noise at its source. This, along with significant modifications in stator design, has resulted in almost unbelievable reductions in sound level. Air inlets have been located away from fans. Noise generated in the motor is now channeled through a lengthy path of acoustically-designed vent passages. Sound-deadening and sound-absorbing materials are used to remove noise before it can be transmitted to the outside.

Other features for dependability and low maintenance

All the advantages that have contributed to the outstanding reliability of Allis-Chalmers 2-pole motors have been retained. In addition, the following new features have been incorporated:

Top Air Intake (available with filter) permits hosing down motor area: motor does not pick up floor dirt.

Top Air Discharge adds to personnel safety and comfort.

Spiral Ventilation provides uniform cooling; aids noise reduction.

Improved Bearing Design prevents oil leakage, simplifies maintenance. Capsule-type housings permit inspection of windings without exposing bearings.

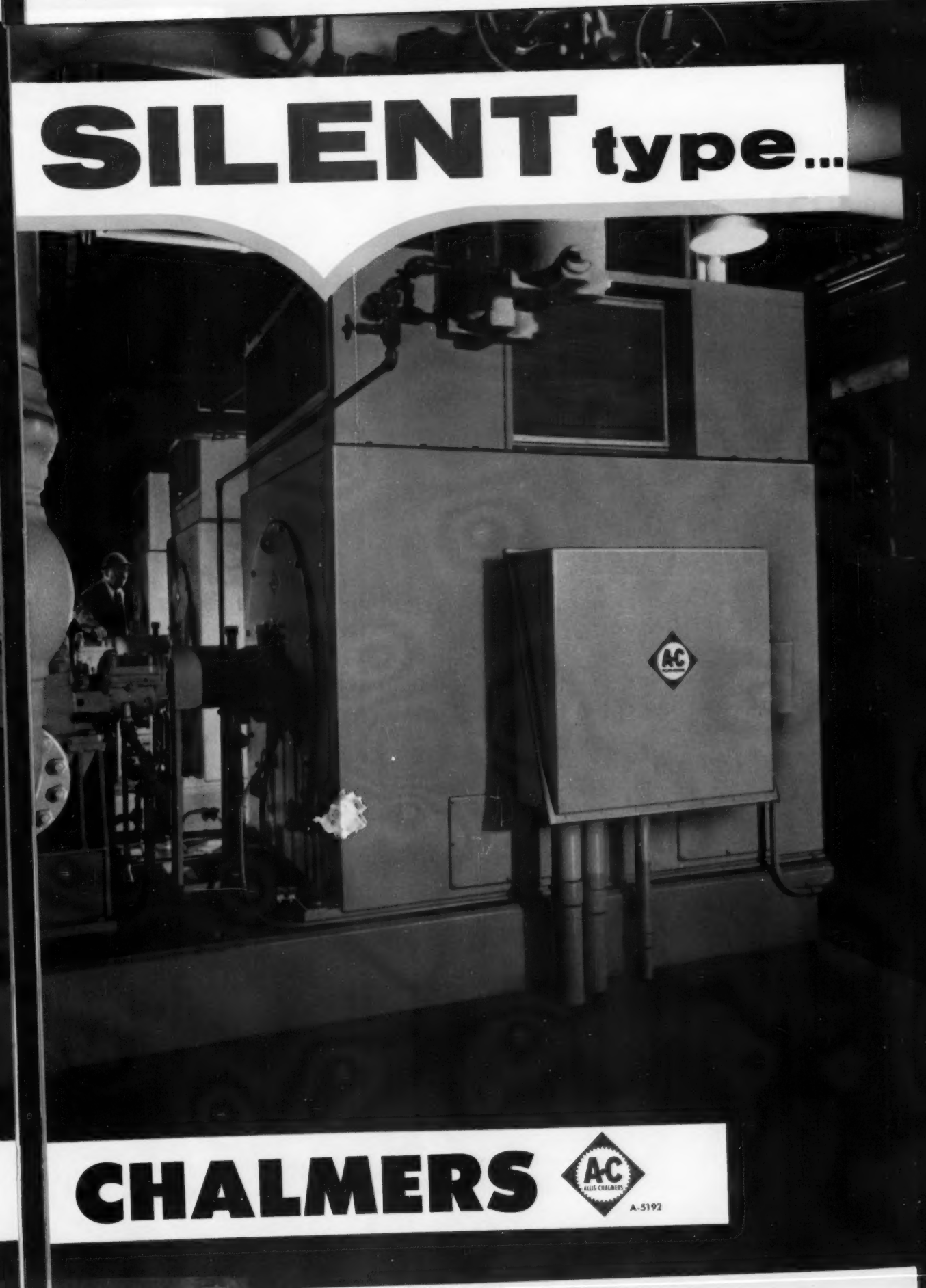
Sound-Engineered Motors speak for themselves — but softly. Acoustic design, affirmed by continuing user satisfaction, was first proved by test analysis of noise frequency levels on these motors.

- Half octave band frequency analyses showed no objectionable levels at any point on the noise spectrum.
- Test readings remained remarkably low, even at troublesome high frequencies.
- Results showed that conversations next to the motor could be carried on without effort.
- Noise level is so low that these motors would be good neighbors in any powerhouse.

Allis-Chalmers 2-pole motors in this design are available in ratings 900 hp and larger. For complete information, see your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

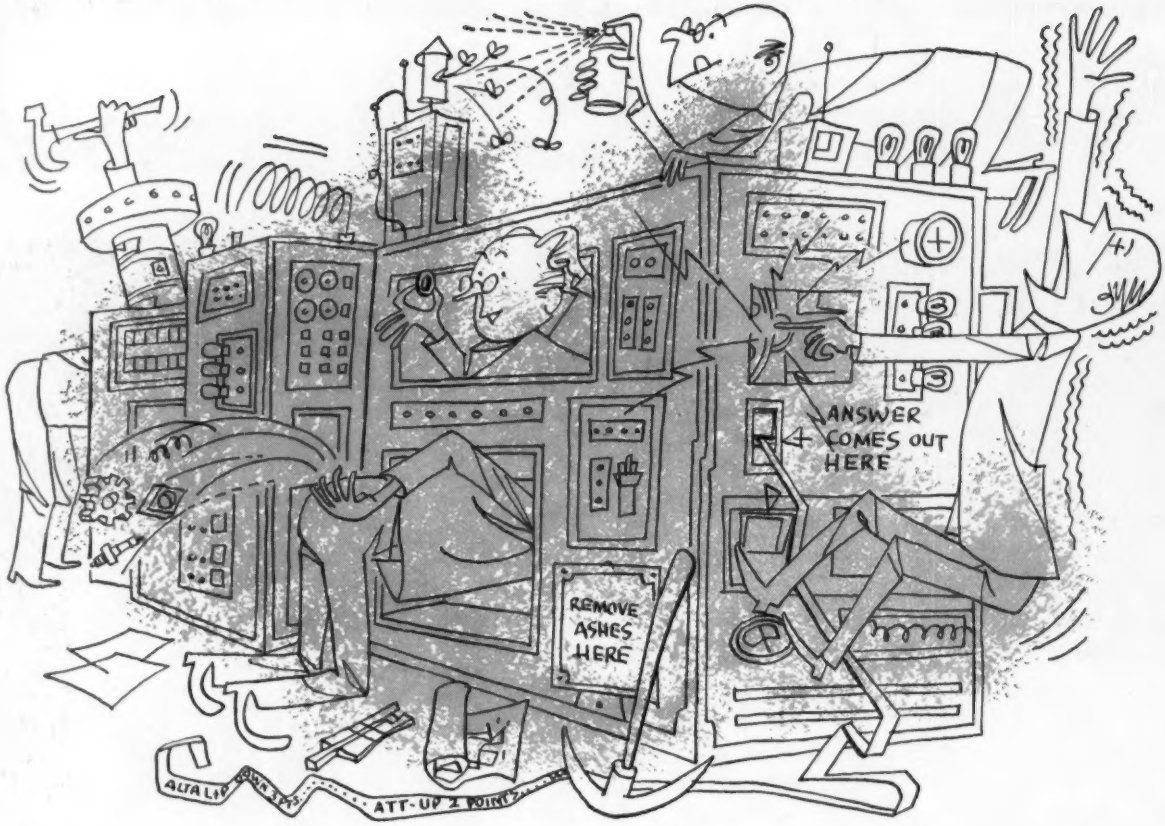
ALLIS-

SILENT type...



CHALMERS

A-5192



Remember the Lightning-Vac?

While we're getting rid of a few bugs, stick with O-B Insulators.

Several power company customers seem to like the idea of a Lightning-Vac, a mythical device for telling at what time and location lightning is going to strike a distribution line.

"Let's order a half dozen."

"Why didn't you think of it before?"

"Are the ashes good for fertilizer?"

These have been a few typical comments and questions.

Naturally, in the face of such customer approval we've charged ahead with our design work. Unfortunately, there are quite a few bugs to be worked out.

In the meantime, we suggest you stick with O-B insulators on your distribution lines. They've been tested and found able to withstand man-made lightning with twice the rate of voltage rise of natural lightning.

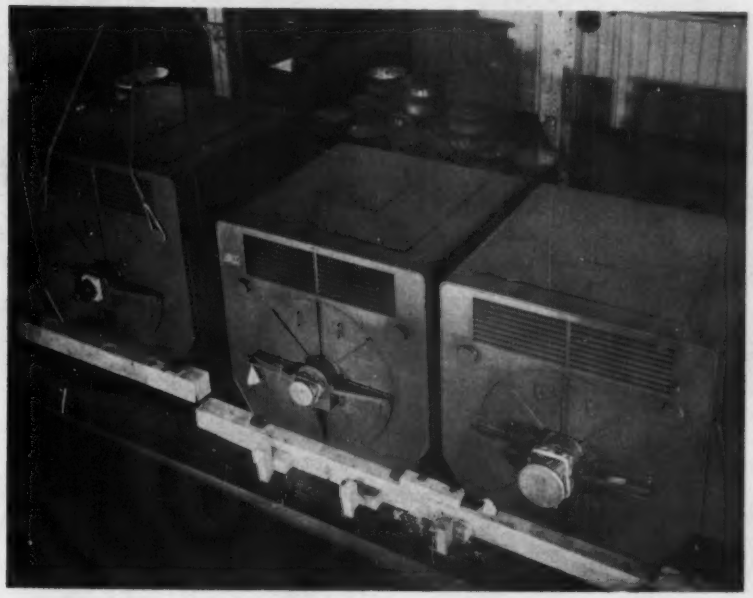
It's our contention that the best protection against lightning is an insulator that won't puncture. So while the Lightning-Vac is being developed, stick with O-B insulators, conveniently available from your nearby Graybar house.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

'GraybaR Distributed by 'GraybaR ELECTRIC COMPANY

4740-H



Detroit Ed Gets 5,000-Hp Pump Motors

Three 5,000-hp, 3,600-rpm, dripproof, super-quiet induction motors are shown being prepared for railroad shipment to the Detroit Edison Co. They will drive boiler feed pumps for No. 3 generating unit (320 Mw) at the River Rouge Station.

These two-pole squirrel-cage 4-kv motors are said to be the largest units for boiler-feed-pump drive shipped to a utility in this country. They are designed with special brackets for easy access by two maintenance men for inspection of bearings, winding, and rotors, for blowing out windings and core, and for revarnishing windings if necessary. The easy-access feature is a special design requested by Detroit Edison Co engineers and developed in co-operation with them.

Elliott shipped previously to the same station, two 2,500-hp motors for ID fans (EW, Jan. 28, p 203), two 1,500-hp motors for FD fans, six 600-hp motors for coal mills, and nine motors ranging from 150 to 600 hp for various pumps.

Burndy Starts Expansion; Doubles 6-Month Earnings

Four major construction projects, all part of a $2.5-million expansion program, have been started by Burndy Corp. The undertakings will be completed by fall, 1957.

A $600,000, 63,000-sq ft addition at the Milford, Conn., plant site will make the facility a major manufacturer of Burndy's OMA-TON Division, serving electrical, electronic, and military equipment producers.

Also two additions at the company's headquarters in Norwalk Conn., will add 79,000-sq ft of space for $850,000. Burndy Canada Ltd, a wholly-owned subsidiary, is building a $700,000 office and manufacturing structure totalling 75,000-sq ft.

Net income for the corporation was $612,333, equal to 65¢ per share of common stock, for six months ending Dec. 31, 1956. This compares with $329,377 for the same period in 1955, or 34¢ a share adjusted to present capitalization. Sales amounted to $11,514,-718 for the last half of 1956. This compares with $9,202,691 in the previous year's period.

In his report to shareowners, President Bern Dibner said prospects for long-range growth look good, with many new lines yet to be marketed in volume.

Allis-Chalmers Ups Prices of Voltage Regulators

Allis-Chalmers Mfg Co, Power Equipment Division, announced a price increase of approximately five percent (5%) on all station type and distribution feeder voltage regulators effective Feb. 15. The changes cover the company's line of AFR, DFR, and JFR regulators and parts.

At the same time list prices of 2500-v distribution regulators were raised to bring them in line with list prices for the 5000-v class.

McGraw-Edison Begins Scientific Lab Network

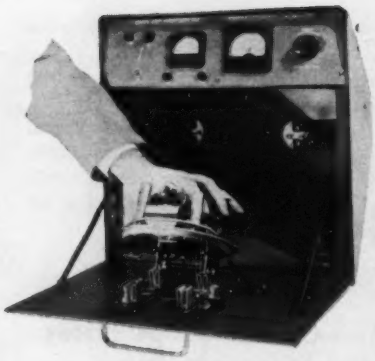
A network of scientific laboratories in 12 states and Canada has been started by McGraw-Edison Co. The facilities, all to be named for Thomas Alva Edison, were described on the 110th anniversary of the inventor's birth.

"We expect to . . . create many new and improved products" in the laboratories, said Max McGraw, president. The set-up marks a major expansion in research and development work, he said.

The main lab will be an expanded building at West Orange, N. J., where Edison headquartered after leaving Menlo Park. Another center is planned in Milwaukee by Line Materials Division, makers of distribution equipment. It will include a short circuit laboratory.

McGraw-Edison held a king-sized birthday party Feb. 11. Some 15,000 plant employees in 29 U. S. and Canadian divisions and subsidiaries celebrated the recent consolidation of McGraw Electric Co and Thomas A. Edison, Inc.

(More M & M on page 112)



Calibrator to be Marketed for Testing Light Controls

An instrument known as the calibrator has been designed for checking and adjusting the turn-on and turn-off points of photoelectric lighting controls. This device, a product of Fischer-Pierce Co, South Braintree, Mass., is ready to be marketed.

This Series 6100 calibrator has been developed to fill a need on the part of electric utilities. Large scale use of photoelectric street light controls has necessitated that they have an accurate instrument permitting fast checking and calibration of the various types of lighting control, states the manufacturer.

The portable unit incorporates a variable intensity light source, which simulates illumination of the blue portion of north sky. Included is a self-contained light measuring instrument. All readings and adjustments are made from the outside of the front panel.

Shown in the illustration is a photoelectric light control being plugged into an interchangeable mounting. When the hinged door is closed and the service cord is plugged into a convenience outlet, the calibrator is ready for testing and adjusting operations.

Longer Soot Blowers Aid Temperature Control

Philadelphia Electric Co is gaining broad range regulation of temeratures for steam generator units No. 1 and 2 of the Cromby Station. Extra-long, retractable soot blowers, made by Blaw-Knox Co's Copes-Vulcan Division, are a primary aid in maintaining the temperature regulation.

Boilers of both units have large steaming areas that are cleaned by Vulcan deslaggers. Remaining surfaces and equipment are cleaned by the soot blowers. The retractable devices have 18 to 28-ft travel extension, and are used as a single installation. Their lance travel and rotation are non-synchronized through two driving motors to produce a double multi-helix cleaning path so that insertion and retraction cover different areas of the tube bank. The blowers for each boiler are connected to automatic-sequential control panels in the plant control room.

Unit No. 2 is a single-drum, controlled-circulation, tangential-fired type built by Combustion Engineering, Inc. Vernier control is achieved by tilting burners, desuperheater sprays, and biasing firing rate to superheat or reheat furnaces. No. 2's steam output is 1.45-million lb/hr at 1,875 psig and 1,000/1,000 F. The Westinghouse Electric Corp turbine has 200-Mw nameplate rating.

The predecessor No. 1 unit is a Babcock & Wilcox Co single-drum, pressurized design for pulverized coal or oil firing. Vernier control is handled by gas recirculation, biasing superheater and reheater dampers, and spray desuperheaters. Continuous steam output is 1.05 million lb/hr at 1,875 psig and 1,000/1,000 F. The GE turbine-generator has 150-Mw rating.

Penellit Gets Contract

Penellit Service Corp, Skokie, Ill., has been awarded an instrumentation-and-control system maintenance contract by Tidewater Oil Co. The contract covers the latter's new Flying A refinery, Delaware City, Del. In addition to relieving Tidewater setting up an instrument maintenance department, the refiner will reportedly have made available trained personnel for peak maintenance.

M & M BRIEFS

Sangamo Electric Co, Springfield, Ill., has been granted license on the fluidized bed technique which is used for coating metal castings with plastic materials. Grantor of this Whirlclad process is Polymer Processes, Inc., Reading, Pa.

Verrall Moe Electronics, Inc., Jefferson, Wis., has been formed to manufacture a product in electric radiant heat that can be sprayed, rolled or printed on the surface of any shape or contour. The product is reported for use in modernization of existing homes and for original installation in new structures.

Union Carbide and Carbon Corp will have a new home early in 1960 in the Union Carbide Building. This 52-story stainless steel and glass building has an estimated construction cost of $46 billion. It will have 1.5 million sq ft space and occupy the block between Madison and Park Ave., from 47th to 48th Sts in New York City.

Bethlehem Pacific Coast Steel Corp will construct a multi-million dollar office building in San Francisco to serve as headquarters for its three steel plants, four fabricating works, and six sales offices serving seven western states, Alaska and Hawaii. Construction is expected to start in autumn.

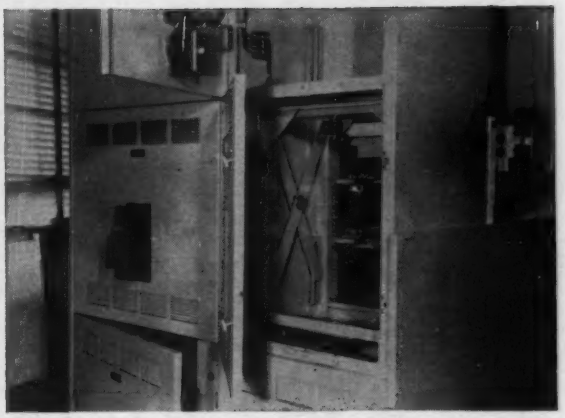
General Automatic Corp is the new name for the former Hedin Tele-Technical Corp. This manufacturer of relays and controls for industrial and military purposes is now located in Mountain View, N. J.

FINANCIAL

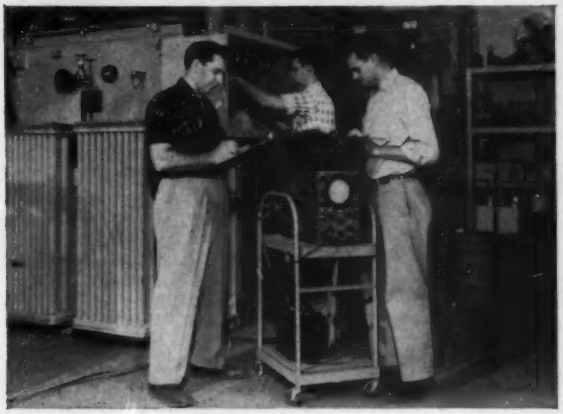
Anaconda Co is offering 1,743,865 common shares on a 1-for-5 basis at $50 a share, record Feb. 14, expiring Mar. 5. Stock is selling for about $63 . . . **Allis-Chalmers** will pay Mar. 30 quarterly common dividend of 50¢ a share . . . **I-T-E Circuit Breaker Co** declared a quarterly common dividend of 37.5¢, payable Mar. 4 . . . **McGraw-Edison Co** will pay Mar. 11 a quarterly dividend of 35¢ a share on new stock resulting from 2-for-1 split effected in January.

SECONDARY UNIT SUBSTATIONS

ENGINEERED AT I-T-E and coordinated to meet the operating conditions found in your plant.



BUILT AT I-T-E with such extra features as circuit breaker test-position with doors closed.



TESTED AT I-T-E to assure ease of installation, and top performance under operating conditions.

SHIPPED FROM I-T-E to assure prompt delivery of one complete "package," ready to install.

I-T-E MAKES IT EASY TO BUY COMPLETELY COORDINATED UNITS

Only I-T-E builds transformers and switchgear in the same plant. This permits them to assume all responsibility for your unit substation requirements. Close association of engineering and production relieves you of detailed planning, paperwork, and the problems of coordinating deliveries. Shipment is from one location. Installation is speeded. Substation components are completely integrated to provide top performance at low overall cost.

Typical of the extra value which *only* I-T-E Unit Substations offer is circuit breaker test-position with doors closed—and without removing them. This means additional safety to operating personnel, greater cleanliness, simplified tagging out of circuits, and longer life. I-T-E Secondary Unit Substations can be supplied for any application, indoor or outdoor, and in any standard rating. For details, contact the I-T-E sales office nearest you. Or write I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

The goal for 1957
VISIT
HANNOVER
The German Electrical Industries Exhibition

The greatest market for investment and consumer goods only at the German Industries Fair, Hannover

APRIL 28 — MAY 7, 1957

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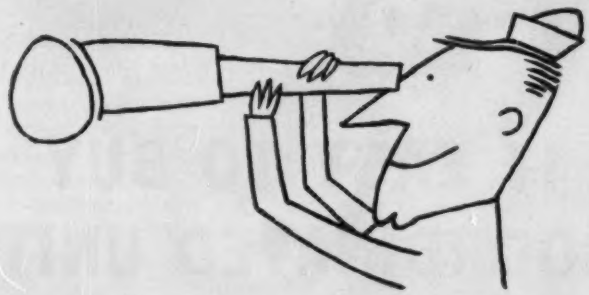
and Zentralverband der Elektrotechnischen Industrie, Frankfurt/M., Am Hauptbahnhof 12

1957 APRIL 28 to MAY 7



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SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co's Industries Group has appointed the following five new representatives to sales offices: Donald P. Bartold, Chicago; Ralph J. Grutsch, Jr, Washington, D. C.; Robert G. Niendorff, New York; Maynard W. Thompson, Miami, Fla.; and Norbert H. Van Laanen, Houston.

General Electric Co has appointed nine district representatives to the sales department of the Construction Materials Division. They are: Lavern L. Allen, who will handle the conduit products line, Northwestern district, Seattle, Wash.; George W. Duerrstein, wiring device, conduit products, and wire and cable lines, North Central district, Appleton, Wisc.; L. Amador Flynt, wiring devices, Southeastern district, Tampa, Fla.; David F. Korb, wiring devices, Mid States district, Louisville, Ky.; Graham B. Mack, wire and cable, North Central district, Chicago; DeWayne McCauley, wiring devices, wire and cable, and conduit products, Southeastern district, Charlotte, N. C.; Walter J. McCleese, wiring devices, Atlantic district, Pittsburgh, Pa.; Leslie A. Storer, wire and cable, Great Lakes district, Grand Rapids, Mich.; and Allen B. Thomas, wiring devices, wire and cable, and conduit products, Southwestern district, Lubbock, Tex. . . . GE's Supply Co Division's supplies and housewares department has designated Elmer A. Sisco as metropolitan regional manager, with headquarters in New York City . . . Newly named Carboloy carbide cutting tool sales representative for GE's metallurgical products department was James DeKoker. He will cover the Texas area, with headquarters in Dallas.

Globe Lighting Products, Inc, has announced the appointment of Wade Robbins as a field engineer. He will service electrical contractors and distributors for the Los Angeles firm.

Joslyn Pacific Co has employed Hinton G. Williams, Jr, to serve as district manager for the northern California and northern Nevada territory.

Sylvania Electric Products, Inc, has named Edward H. Furbank as district sales manager for its recently established district sales office for lighting products at Mineola, Long Island (N. Y.). The territory, which includes Brooklyn, Queens, Nassau, and Suffolk counties, was previously covered from the New York-New Jersey district office in Teterboro, N. J. Also assigned to the new district are lamp sales representatives V. F. Bangert, Lloyd Benett, William Dix, and Edward Henderson, and fixture sales representative David Wick.

Westinghouse Electric Corp's Supply Co has designated W. T. Pavlik to head its recently opened apparatus and supply warehouse in Cleveland, Ohio. The new warehouse will be known as the St. Clair Branch.

"You're right, Walters," said the V-P...

"Yes," mused the V-P in Charge of Engineering to his luncheon companion, "from the information I get, Walters, I've also concluded that we ought to push for an early start on the new plant,—keep clear of those short-capacity situations."

He had been studying young Walters carefully since their conversation had settled on the subject of the Company's future. "You're right, Walters, but where did you get your data? Most of the material available to me——"

"——isn't available to me," Walters finished for him, smiling. "That's true, Mr. Redmond, **most** of it isn't. But I can read the Electrical Business Outlook page of Electrical World and their other forecasts as well as you can—and I do!"

"Of course," replied Redmond, looking a little sheepish. "Why do I always assume that that particular page is written only for me?"

"Oh, everybody does the same thing," answered Walters. "I get the same feeling about articles in my own field—that they're written for me particularly. But I read practically everything in that magazine every week, whether it's in my area or not,—you'd be surprised how much useful information I pick up."

"You've got to get up earlier than that to surprise **me,"** laughed Mr. Redmond, reaching for the check. "I was doing exactly that when you were in three-cornered pants!"

Thomas F. Peterson Wins Gano Dunn Medal

The third annual Gano Dunn Medal for outstanding professional achievement was awarded recently to Thomas F. Peterson, Preformed Line Products Co.

The award, sponsored by Cooper Union Alumni Association, was presented to Peterson (center) by Nicholas M. Molnar, past president of CUAA (right). At left is Dr Edwin S. Burdell, Cooper Union president.

Peterson, founder and president of Preformed Line, holds hundreds of patents in the field of electrical cable and power transmission accessories and other electrical products. He is a 1923 electrical engineering graduate of Cooper Union and also holds an EE degree from Stanford University.

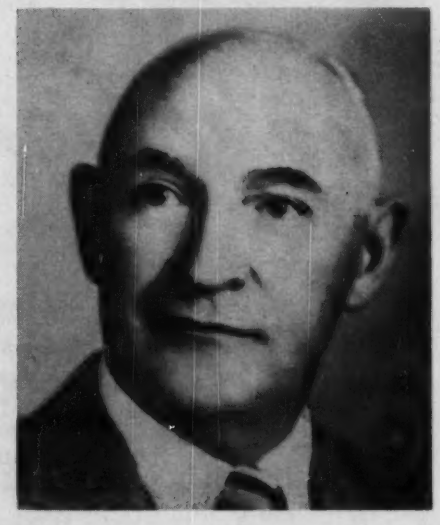
Previous awards went to William Dubilier, inventor of Dubilier mica condenser, and M. F. Ketay, who developed instrumentation for automatic control systems.

PNP Names New President

Newly elected president of Pacific Northwest Power Co is John J. Burke, chairman of the board of Metals Bank & Trust Co of Butte, Mont. He succeeds Kinsey M. Robinson, president and board chairman of Washington Water Power Co, who has been elected chairman of the board of PNP.

PNP is an organization of four utilities—Pacific Power & Light Co, Portland General Electric Co, Montana Power Co, and WWP—which is at present seeking a federal license to build hydroelectric plants at Mountain Sheep and Pleasant Valley on the Snake River. The projects are expected to add 1,183,000 kw to the area.

Burke, who has been a WWP director since 1952, entered the banking field in 1919. He served in positions of increasing responsibility and was elected president and board member of Metals Bank in 1945. He has been chairman of the board for the past year.



JOHN J. BURKE

Kentucky Utilities Ups Stewart, Duncan to VP's

A. CLAY STEWART

Kentucky Utilities Co has elected A. Clay Stewart and William A. Duncan, Jr, as vice presidents of the company.

Stewart has served as assistant to the president since 1951. During his 30-year career with KU and a predecessor, Kentucky Power & Light Co, he has held several executive posts, including executive assistant and head of the utility's statistical department.

Duncan, who has been assistant vice president since 1954, joined KU in 1935 after receiving his engineering degree from the University of Kentucky. Before being named to his most previous position he held several engineering posts in the KU general office. He is a member of American Institute of Electrical Engineers.

WILLIAM A. DUNCAN, JR

ADVERTISEMENT

TYPICAL PROPERTIES OF POLYETHYLENE (not specification values)

PHYSICAL and MECHANICAL

PROPERTY	UNITS	TEST METHOD	VALUE
Tensile Strength	Lb./sq. in.	D412—51T	1600—2000
Ultimate Elongation	%	D412—51T	350—600
Brittleness Temperature	°C.	D746—51T	−60 to −95
Stiffness (25°C.)	Lb./sq. in.	D747—50	20000—25000
Compressive Strength	Lb./sq. in.	D695	4000
Hardness, Shore		D676—49T	C81, D48
Softening Point	°C.	ASTM	95
Melting Point	°C.		115—125
Thermal Conductivity	BTU/hr./sq. ft./°F./in.		1.75
Melt Index	dg./min.	D1238—52T	0.95 to 1.6
Specific Gravity		D792—50	0.92

CHEMICAL

PROPERTY	RELATIVE RESISTANCE
Acetic Acid	Good
Chromic Acid	Fair
Hydrochloric Acid	Good
Nitric Acid	Good
Sulfuric Acid	Excellent
Alkalies	Good
Ethyl Alcohol Solvent	Good
Aromatic Hydrocarbon Solvent	Not Recommended
Chlorinated Solvents	Not Recommended
Ethylene Glycol, Gasoline, Oils	Good
Kerosene	Fair
Soaps	Excellent

ELECTRICAL

PROPERTY	UNITS	TEST METHOD	VALUE
Power Factor		D150—47T	
@ 60 cycles			0.0003
@ 10^4 cycles			0.0003
@ 5×10^7 cycles			0.00044
@ 3×10^8 cycles			0.00035
Dielectric Constant		D150—47T	2.3
60 Cycle Dielectric Strength	Volts/Mil.	D149—44	1050
Impulse Strength	Volts/Mil.		1800—2500
Arc Resistance	Sec.	D495—48T	30
Volume Resistivity	Sec.	D257—49T	$> 10^{17}$
Surface Resistivity	Ohm-CM.	D257—49T	$> 2 \times 10^{14}$
Ozone Resistance		D470	No Effects

Progress report on Polyethylene

CURRENT TRENDS

No. 5 in a series of articles

Its origin

In 1940, the first samples of polyethylene resin (manufactured in England) appeared in this country. Now, only fifteen years later, it has become one of industry's most popular plastics. And there is every indication that it will be one of the most plentiful, as well as economical plastics. Rome Cable is proud to have played a most active pioneering role in this development and application of polyethylene—under the trade name of RoLene.

What it is

Polyethylene, a pure hydrocarbon thermoplastic resin, is produced from the polymerization of ethylene gas. It is applied to wires and cables by the extrusion process and only a very minor quantity of compounding ingredients are added—an antioxidant or heat stabilizer, plus pigment for weather protection.

Why polyethylene?

Polyethylene, because of several unique properties, is ideally suited for many wire and cable applications. Electrically, it is in itself the best dielectric material that can yet be utilized as cable insulation. Of all the nonmetallic materials it has the highest resistance to moisture and, in addition, possesses outstanding mechanical resistance to extreme cold temperatures. It is highly resistant to most chemicals and oils—even more so than the conventional polyvinyl chloride, and various rubber compounds used on wire and cable. It also excels most of these materials on abrasion resistance.

Polyethylene, when properly pigmented, is inherently resistant to weathering and sunlight. Conventional polyethylene supports combustion or flame but by proper compounding (as in the case of Rome Cable's RoSeal) can be rendered flame retardent. Being a thermoplastic, conventional polyethylene softens readily at about 225°F., but exhibits no plastic flow at temperatures up to 190°F. Since it is essentially a pure hydrocarbon it possesses excellent resistance to aging and oxidation. It is, of course, obvious that such properties, plus its low cost, admirably qualify polyethylene for a host of wire and cable uses.

The history of polyethylene as applied to wire and cable products is indeed significant. During World War II years practically the entire supply of the material was allocated to special insulated coaxial cables for radar, radio, and important military communication circuits because of its superior dielectric properties. Since the war, many commercial applications have been explored with equal success. These include weatherproof wire, street lighting cables, control, supervisory and telemetering cables, telephone cables, service cables and power distribution cables up through 15 kv rating. One of the increasingly popular uses of polyethylene has been as a jacket or sheathing material on telephone and power cables and as a protective covering for lead sheaths. Rome Cable was among the first to introduce polyethylene on such wire and cable products as weatherproof wire, triplex service drop, ornamental pole and bracket, REA telephone cable, station control cable, tree wire, neon sign cable, 5 and 15 kv power cables, as well as RoSeal, a flame-retardent cable sheath. Naturally a wealth of experience has been gained with these applications.

Its applications

Industry specifications pertaining to polyethylene have been established in recent years. For example, ASTM Specification D 1248 describes the materials for use on wires and cables and various IPCEA Appendices describe actual constructions for power and control applications. ASA is now preparing a specification for polyethylene covered weatherproof wire. Polyethylene also complies with Military Specification MIL-D-3054.

Polyethylene has many interesting and valuable applications in electric utility operations today. Several of our modern generating plants utilize literally millions of feet of polyethylene insulated control cables that provide reduced dimensions, added moisture protection—particularly on dc circuits in wet locations—and maximum dielectric properties. For overhead distribution, polyethylene is now regularly used as weatherproof wire covering, and as insulation on triplex service drop cables mainly because of its superior physical characteristics, resistance to weather and oxidation, and reduced weight. Applications to street lighting circuits are numerous, underground or overhead series and multiple circuits, as well as from the pole or bracket to the fixture itself. Most of the new communication, telemetering, or supervisory circuits also utilize polyethylene insulation. The foregoing applications have gradually proven themselves during the last ten years so that polyethylene has become, or is becoming, the preferred material for these uses.

Industry, particularly certain chemical processing plants, has been advantageously using polyethylene insulated 5 and 15 kv power feeder cables for several years. A summary report on these applications is presented in "Kabelitems," Number 79, available from the Bakelite Company, 30 East 42nd Street, New York 17, New York.

In addition to the technical merits of polyethylene, probably the greatest impetus to its rapid acceptance has been in the economy accrued therefrom. In the product types described above, polyethylene construction is substantially equal in cost to alternate designs using other materials, and in most cases, considerably less than the conventional alternate wire and cable products. The available supply of polyethylene seems assured since there are now at least ten known producers of the raw material.

To operating people as well as the cable installer, the ease of handling polyethylene has definite advantages. Polyethylene cables are generally lighter in weight and smaller in diameter than alternate designs. It has a hard, smooth, waxy and clean surface so that it is easily handled. It can even be installed at sub-zero temperatures because of polyethylene's excellent resistance to cold.

Its future

Variations and improvements in polyethylene are being continually announced. For example, some new polyethylenes have already been announced that have a higher melting point and improved resistance to mechanical abuse and abrasion. Future commercial applications of these materials seem assured and it has been estimated that approximately 85,000,000 pounds of polyethylene will be used in wire and cables during the year 1960.

ROME CABLE CORPORATION, Rome, New York

Bersted Advanced by McGraw Edison

Alfred Bersted has been elected executive vice president of McGraw-Edison Co, recently organized company formed by the merger of Thomas A. Edison, Inc, with McGraw Electric Co.

Bersted has been president of Bersted Manufacturing Co Division of McGraw Edison and a vice president of the firm. He began his career with his father's firm, Bersted Mfg. Co. He acquired Manning-Bowman Co in 1941 and seven years later merged with McGraw Electric. He has headed all appliances divisions of McGraw Electric since 1954.

ALFRED BERSTED

Way Elected Sales VP

Jasper Blackburn Corp's newly named vice president in charge of sales is K. R. Way. In addition to his new position, he retains his post as vice president and general manager of Pieper-Lillard, Inc, a wholly owned Blackburn subsidiary.

Way has been associated with Blackburn since 1949, when he was employed as sales manager. He previously served for 13 years as a sales executive with other electrical equipment manufacturers.

Florida Power Elevates Shenk, Bunnell

W. B. SHENK

M. F. BUNNELL

The promotions of W. B. Shenk to general sales manager of Florida Power Corp and of M. F. Bunnell to manager of industrial relations has been announced by J. S. Gracy, vice president.

Shenk has been director of commercial and industrial development since early in 1954, and Bunnell has served as director of personnel for over six years.

In his new position Shenk will be in charge of commercial, industrial, and residential development, as well as community development. All sales departments in the company will report to him. A veteran of 25 years with Florida Power, he served as director of the commercial development department from 1945 until his 1954 appointment.

As manager of industrial relations, Bunnell will handle all labor relations, personnel policies, and the safety department. He has been with Florida Power since 1926, and after serving as district manager he joined the personnel department in 1944. There he rose from assistant employment manager to director of personnel in June, 1950.

PERSONAL BRIEFS

Oklahoma Utilities Association has elected the following officers for the year 1957: president—**H. P. Hoheisel,** advertising and publicity manager, Oklahoma Gas & Electric Co; first vice president—**Dale E. Frieden,** president, Zenith Gas System, Inc; second vice president—**Wright Canfield,** vice president, Public Service Co of Oklahoma; treasurer—**H. H. Ferrin,** vice president and treasurer, OG&E.

William L. Kimsey was recently appointed to the new position of market development director for Arizona Public Service Co. He will have charge of co-ordinating and administering the firm's sales and marketing program which includes research, long-range forecasts, and training.

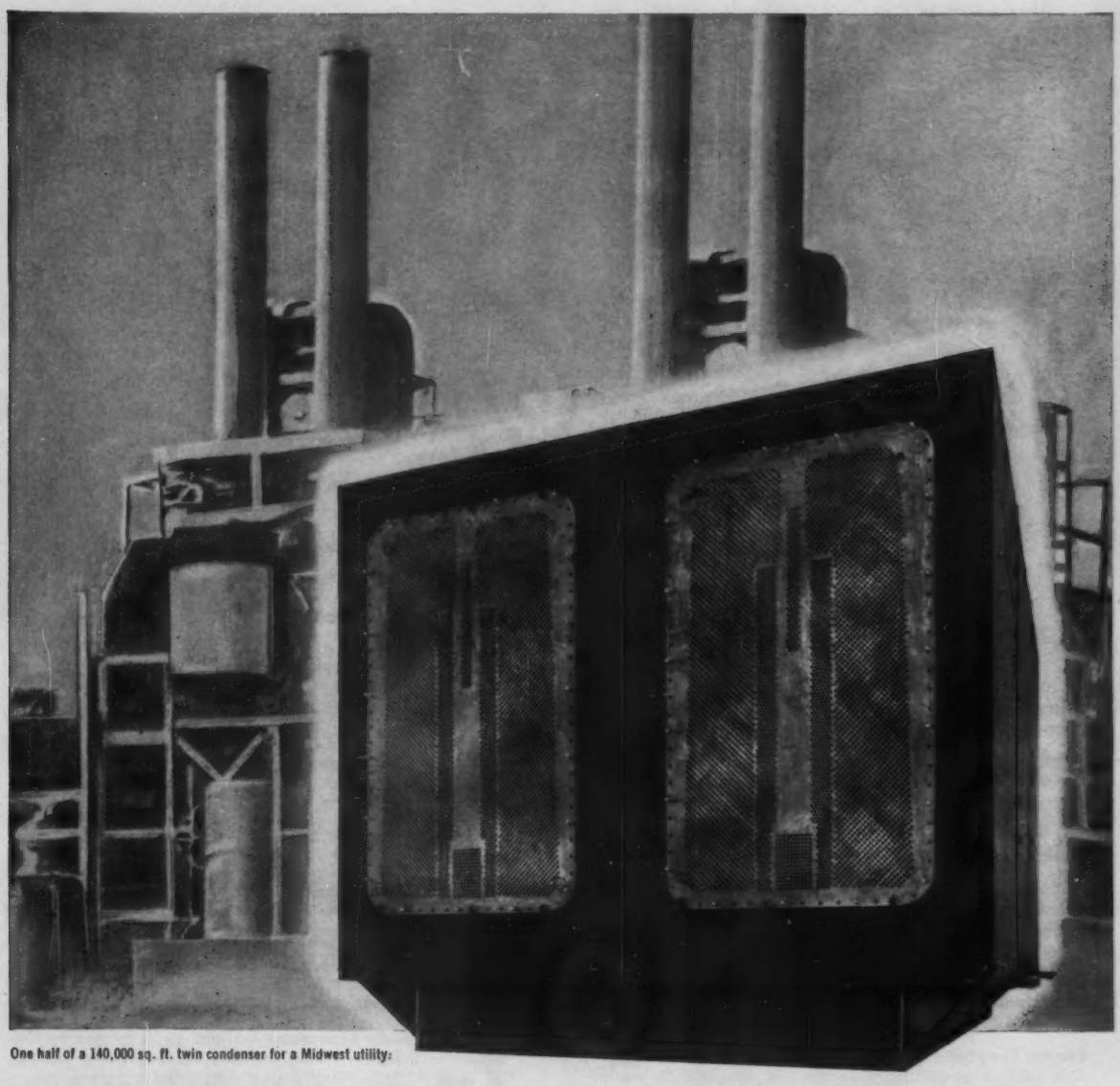
Puget Sound Power & Light Co has announced the election of **Ralph Stormans** to its board of directors, replacing **J. N. Donovan,** who resigned. Other promotions made **George Artus** superintendent of the Shuffleton steam plant, **John King** internal auditor, and **Art Kramer** assistant engineer with the company's Southern Division in Olympia. Kramer was formerly editor of Puget Power News and is succeeded by **Ken Kraft.**

William H. Mann, formerly gas and electrical superintendent of the Defiance (Ohio) Division of Toledo Edison Co, has been transferred to the company's Toledo office as staff engineer in the sales department in charge of electrical space heating and air conditioning.

Deskin O. Bergey has been named to succeed retiring **Lloyd W. Edwards** as assistant general manager of Pacific Power & Light Co's Coast Division.

Southern Indiana Gas & Electric Co has appointed **M. A. Woehler** manager of the Rockport district. He replaces **Earl Waggoner** who is being assigned to engineering work in Evansville. **Hubert H. Taylor,** formerly senior accountant, was appointed supervisor of the stores accounting department to succeed Woehler.

(More Personal Briefs on page 122)



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MEETINGS CALENDAR

FEBRUARY

Wisconsin Utilities Association—Engineering Institute on Power System Protection Meeting, University of Wisconsin, Madison, Wis., Feb 25-27.

American Society of Heating and Air-Conditioning Engineers—63rd Annual Meeting, Chicago, Ill., Feb. 25-28; 13th International Heating and Air-Conditioning Exposition, Chicago, Ill., Feb. 25-Mar. 1.

Institute of Radio Engineers—Western Joint Computer Conference, Hotel Statler, Los Angeles, Calif., Feb. 26-28.

Electrical Equipment Representatives Association—Annual Meeting, St. Anthony Hotel, San Antonio, Tex., Feb. 27-Mar. 2.

Pacific Coast Electrical Association—Business Development Section, Sheraton-Palace Hotel, San Francisco, Calif., Feb. 28-Mar. 1.

Pennsylvania Electric Association—Relay Committee, Roosevelt Hotel, Pittsburgh, Pa., Feb. 28-Mar. 1.

MARCH

Southern Safety Conference—Conference and Exposition, John Marshall Hotel, Richmond, Va., Mar. 3-5.

National Rural Electric Cooperative Association—Annual Meeting, Conrad Hilton Hotel, Chicago, Ill., Mar. 4-7.

Louisiana State University—Annual Conference on High-Speed Computers, Baton Rouge, La., Mar. 5-8.

• **Edison Electric Institute**—Financing and Investor Relations Committee, Hotel Biltmore, New York City, Mar. 7; Industrial Relations Committee, EEI Headquarters, New York City, Mar. 21.

Street Tree and Utility Conference—Hotel Cleveland, Cleveland, Ohio, Mar. 7-8.

Engineers Joint Council—2nd Nuclear Engineering and Science Conference; 3rd International Atomic Exposition, and 5th Hot Laboratories and Equipment Conference, Convention Hall, Philadelphia, Pa., Mar. 11-15.

• **National Association of Corrosion Engineers**—Annual Convention, Kiel Auditorium, St. Louis, Mo., Mar. 11-15.

Electric Companies Public Information Program—Inter-Regional Committee, President Hotel, Kansas City, Mo., Mar. 7; Steering Committee, New York, Mar. 14.

National Electrical Manufacturers Association—General Engineering Committee, Switch and Enclosed Breaker Section, Chase Hotel, St. Louis, Mo., Mar. 13; Panelboard and Distribution Board Section, Molded Case Breaker Section, and Busway Section, Chase Hotel, St. Louis, Mo., Mar. 14.

Institute of Radio Engineers—Annual National Convention and Radio Engineering Show, Waldorf-Astoria Hotel and New York Coliseum, New York City, Mar. 18-21.

American Society of Mechanical Engineers—Gas Turbine Conference, Sheraton-Cadillac Hotel, Detroit, Mich., Mar. 18-21; Engineering Management Conference, William Penn Hotel, Pittsburgh, Pa., Mar. 27-28.

American Power Conference—19th Annual American Power Conference, Hotel Sherman, Chicago, Ill., Mar. 27-29.

Electric Meter Institute—Eighth Annual Session, University of Denver, Denver, Colo., Mar. 25-29.

Oklahoma Utilities Association—Annual Convention, Hotel Tulsa, Tulsa, Oklahoma, Mar. 28-29.

Illuminating Engineering Society—Pacific Northwest Regional Conference, Empress Hotel, Victoria, B. C., Canada, Mar. 28-30.

APRIL

Edison Electric Institute—Industrial Power and Heating Committee, Edgewater Beach Hotel, Chicago, Ill., April 1; Sales Conference, Edgewater Beach Hotel, Chicago, April 1-4; Accounting Division Advisory and Executive Committee, Madison Suite, Sheraton Park Hotel, Wash., D. C., April 8; National Accounting Conference of Electric & Gas Utility Accountants, held jointly with AGA, Washington, D. C., April 8-10; Industrial Relations Committee, jointly with Personnel Sections of Indiana Electric Assn and Ohio Electric Utility Institute, and Personnel Practices Committee of Pennsylvania Electric Assn, Netherland Plaza Hotel, Cincinnati, Ohio, April 18-19; Meter and Service Committee, Sorono Hotel, St. Petersburg, Fla., April 24-26; Purchasing and Stores Committee Executive Committee and 10th Annual Meeting, Penn Sheraton Hotel, Pittsburgh, Pa., April 28-May 1; Accident Prevention Committee, Algiers Hotel, Miami Beach, Fla., April 29-May 1.

Southeastern Electric Exchange—24th Annual Conference, Boca-Raton Hotel and Club, Boca Raton, Fla., April 1-3.

National Industrial Conference Board—8th Atomic Energy Courses for Management, Westchester County Club, Rye, N. Y., April 1-6.

Indiana Electric Association—17th Annual Young Men's Utility Conference, Terre Haute House, Terre Haute, Ind., April 3-4.

Missouri Valley Electric Association—Engineering Conference, Hotel President & Municipal Auditorium, Kansas City, Mo., April 3-5.

Northwest Public Power Association—Annual Membership Meeting, Benjamin Franklin Hotel, Seattle, Wash., April 3-5; Engineering and Operations Section, Tacoma Utility Center and Winthrop Hotel, Tacoma, Wash., April 23-24.

• **American Society of Mechanical Engineers**—Spring Meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala., April 8-10.

Northeast Missouri Electric Power Cooperative—Eighth Annual REA Electric Generating Plant Operation and Maintenance Conference, Phillips Hotel, Kansas City, Mo., April 8-11.

National Electrical Industries Show—Fourth National Electrical Industries Show, 71st Regiment Armory, Park Ave and 34th St., New York City, April 8-11.

Institute of Radio Engineers—First Annual Conference on Electronics in Industry, Illinois Institute of Technology, Chicago, Ill., April 9-10.

American Welding Society—Fifth Welding Show, Convention Hall, Philadelphia, Pa., April 9-11.

Electrical Engineers (ASEE) Exhibition, Ltd—Sixth Electrical Engineers Exhibition, Earls Court, London, England, April 9-13.

Maryland Utilities Association—Annual Spring Business Conference, Lord Baltimore Hotel, Baltimore, Md., April 12.

• **American Institute of Electrical Engineers**—Great Lakes District Meeting, Hotel Fort Des Moines, Des Moines, Iowa, April 15-17; Third Biennial Conference on Electric Heating, sponsored jointly by AIEE and the Toledo section of AIEE, Commodore Perry Hotel, Toledo, Ohio, April 23-24.

Agricultural and Mechanical College of Texas—Tenth Annual Conference for Protective Relay Engineers, A&M College of Texas, College Station, Tex., April 15-17.

Rocky Mountain Electrical League—Spring Conference, Shirley-Savoy Hotel, Denver, Colo., April 21-24.

Association of Edison Illuminating Companies and Edison Electric Institute—Meter and Service Committee, Sorono Hotel, St. Petersburg, Fla., April 24-26.

• Additions this week.

Lincoln J2T Singlephase Thermal-Demand Watthour Meter.

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A large southwestern utility operating over a wide territory, under adverse operating conditions, reports that only 0.3% of all Lincoln JT and J2T thermal-demand meters have given any kind of trouble over a ten year period of time.

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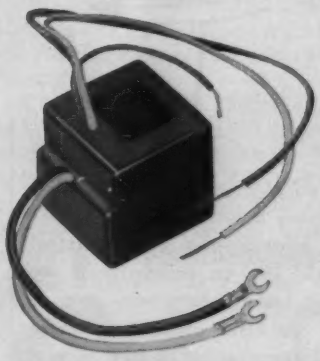
The J2T is ideally suited for application to singlephase residential and commercial loads. It is supplied with scale values of 12 KW, 24 KW, and 48 KW to take full advantage of the capacity of J2 Watthour Meters. It is also available with dual range scales for growing loads.

You, too, can cut demand measurement costs—eliminate maintenance troubles, by using Lincoln J2T Meters. If you would like to know more about the J2T, write us today.



Encapsulated coil assures maximum protection from lightning and high voltage surges.

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SM37-1

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Personal Briefs *(Continued from page 118)*

North Dakota Public Service Commission has as its new president for the ensuing year **Ernest D. Nelson** . . . In Ohio, **Everett H. Krueger, Jr,** has been designated chairman of the Public Utilities Commission.

Newly named as a commissioner and chairman of Michigan's Public Service Commission was **William R. Hart.** He succeeds **John H. McCarthy** who resigned.

Minnesota Power & Light Co has promoted **John A. Stark** from assistant Cloquet Division superintendent to Little Falls Division engineer . . . **Lawrence M. Duryee** has been named to the new post of Western Division industrial sales engineer by Connecticut Light & Power Co.

Everett G. Oates was recently named industrial development counselor of Arkansas Power & Light Co . . . Ohio Power Co has designated **Robert L. Wolfe** as area development director, a position created as part of the utility's expanded area development program.

Atomic Energy Commission has established an Inspection Division at its Oak Ridge operations. **Leo Dubinski** will become director of the new division and **H. J. McAlduff, Jr,** deputy director.

At the East Pittsburgh Division of Westinghouse Electric Corp, **J. W. Stirling** has been named manager and **P. D. O'Donnell** assistant manager of the power circuit breaker department. **A. A. Johnson** has been named manager of the assembled switchgear and devices department in the same division.

Minnesota Mining & Manufacturing Co has elected **Arnold L. Moe** as production supervisor for electromechanical products, electrical products division.

G. A. Godwin and **Edward L. Nung** were elected vice presidents of P. R. Mallory & Co, Inc. In their new capacities, Godwin will be general manager of the Mallory Metallurgical Divisions, and Nung general manager of the Mallory Electronic Divisions.

Robert J. Wolf was recently named division manager of Kaiser Engineers, a division of Henry J. Kaiser Co.

Sylvania Electric Products, Inc, has appointed **Robert E. Betts** manager of manufacturing services for its Lighting Division. **Alton C. Kendall** has been designated to the new post of operations manager-fixtures in the same division.

General Electric Co's industrial heating department has named **Robert B. Hanna, Jr,** general manager . . . In GE's foundry department a new manager-manufacturing engineer and two assistants have been appointed. They are, respectively, **Edwin S. Lawrence, William T. Herrick,** and **Kenneth N. McIver.**

Russell Brittingham, formerly vice president and director of purchases for Corning Glass Works, has been appointed president of Pittsburgh Corning Corp. Along with this change four other appointments were made at Corning Glass Works: **Thomas S. Wood, Jr,** is new director of purchases succeeding Brittingham; **George W. Douglas** replaces Wood as manager of lamp sales department, Electrical Products Division; **Frederick F. Fleischman, Jr,** succeeds Douglas as manager, lighting sales department, Technical Products Division; and **R. Dale Sweigart** will follow Fleischman as field sales manager of plant equipment sales department in the same division.

OBITUARY

Clifford R. Beardsley, 71, retired vice president of Consolidated Edison Co, died recently in Huntington Hospital, Long Island.

William E. Wood, 69, a former president and executive vice president of Virginia Electric & Power Co, died recently of a heart attack. He was a driving force behind the establishment of the Southeastern Electric Exchange-Georgia Tech Public Utilities Executive Course.

READERS FORUM

Subscribes 59 Years, Still a Booster

To the Editor:

I have read with considerable interest Mr Wayne Adams's letter to you on page 320 of your Sept. 17 issue and thoroughly agree with him that Electrical World has increased in liveliness. I also am in favor of it as all your readers must be.

Your articles are short, directly to the point, and well illustrated with timely clear pictures of sufficient size to tell their story at first glance. Your indexing through the pages is wonderful and helps the reader to find what he wants.

The advertisers are catching on with the most up-to-date Ads I have ever seen.

All this adds up to the fact that I can read the issues in much less time and obtain a clearer picture of what is going on.

These are my views based upon the fact that I have been a subscriber since 1898, and in my historical researches I have read all or part of every issue since publication began in 1883. Furthermore, I have known every editor since 1900. All did a splendid job in their day, but your present staff tops them all. Of course, I know the answer to all this, but in fairness to my generation I must admit that we did a marvelous job in bringing up and educating our youngsters.

E. S. Lincoln
Consulting Engineer
Room 1410
52 Vanderbilt Ave.
New York 17, N. Y.

To the Editor:

I just finished the Jan. 14 issue of Electrical World. Frankly, I like the new arrangement—each issue the same size, each issue with good technical articles, and all printed in easier-to-read type. The last is doubly appreciated by my tired old eyes.

I especially enjoyed two articles: the interview with John Turkevich and the Wade Larkin story about architectural students designing transmission structures. What won't these utility boys think of next.

H. C. McDaniel
Technical Publicity
Westinghouse Electric Corp
Pittsburgh 30, Pa.

To the Editor:

Congratulations on the "new" Electrical World. I have read it with much interest and think the improvements are excellent.

Philip H. Powers
President
West Penn Power Co
Greensburg, Pa.

To the Editor:

I like the new Electrical World. It is easy to read, and the yellow News-Scope really gives you all the dope and fast.

Lawrence Jennings
570 Lexington Ave.
New York, N. Y.

To the Editor:

I just read the first copy of the "New" Electrical World. I liked it.

P. T. Lagrone
Manager
Electric Utility Sales Department
Westinghouse Electric Corp
East Pittsburgh, Pa.

Addition, not Subtraction

To the Editor:

In Electrical World today (Jan. 14) I saw an error in the story on the new supervisory training program of Indianapolis P&L Co.

This new program is to supplement, not replace, our supervisors' on-the-job training which always has been and must continue to be essential for new supervisors.

Knowing how such mistakes can happen, I am writing this merely to keep the record straight.

John G. Longsdorf
Executive Assistant
Indianapolis Power & Light Co.
Indianapolis 6, Ind.

Oldtimers Spark History

(*Continued from page* 50)

who before his retirement was assistant to the general manager, a librarian, an employee magazine editor, a research assistant, and the author.

There were gaps, some formidable, to be filled in files on the company's shadowy early years. Old records were incomplete compared with the thorough recording and reporting practices of the industry today. There were a few beautifully penned letters, some contracts, and ledgers which could augment brittle news clippings and reminiscences by a few oldtimers. The committee ruefully recalled that the first president, successful woolen merchant Austin C. Dunham, had said, "All I need to run this company is a pad and pencil and a place to sit."

Veterans Are Valuable Source

The committee decided that its most valuable source of past facts were the older employees, both active and retired. Interviews were arranged, but a secretary was not always available to take down the many stories and details that the oldtimers enjoyed spinning out. A tape recorder solved that.

The Hartford Courant's back-number volumes, covering the first 10 or 15 years of the company's existence, were scanned page after yellowed page at the State Library. A portable photostating machine was used to bring back the fruits of the search.

A bound volume of 1892 Electrical World issues, found in a second-hand bookstore, proved to be full of items about HELCO. This find led to a spot check of other EW volumes at the McGraw-Hill library in New York. Subsequently Edison Electric Institute took over the job of searching through some 30 years of back issues.

The task of collecting material is now largely finished; that of organizing and writing has begun. Those close to the project believe the resulting history of this relatively small company (106,000 customers) will add to public understanding of the utility industry today. At the project's rather modest total cost now anticipated, this would be a bargain indeed.

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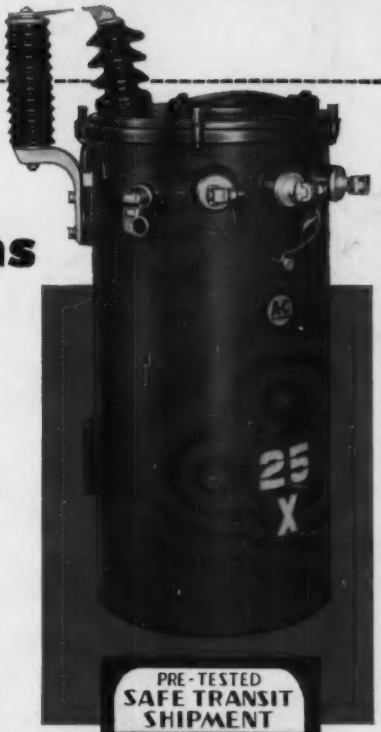

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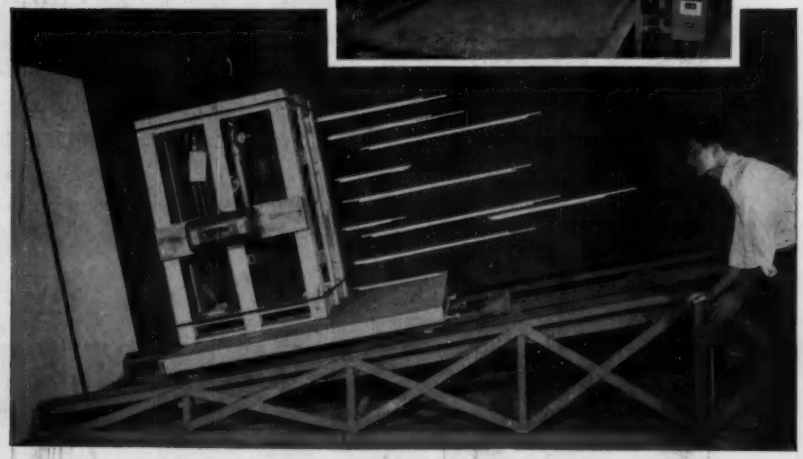

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